

# THE BOOK OF AIRPLANES





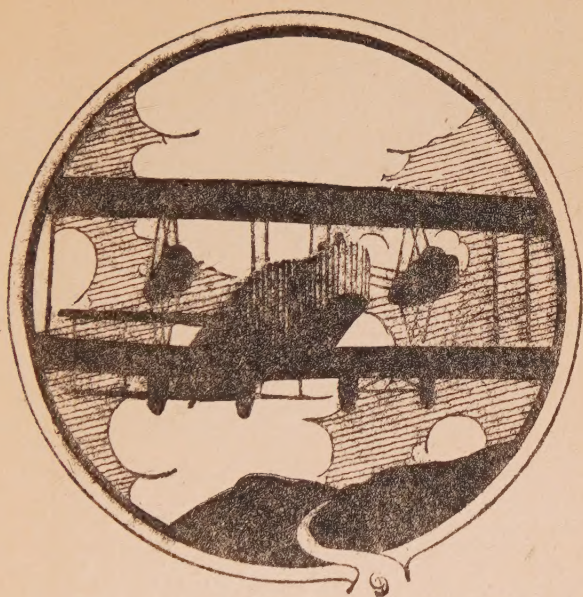


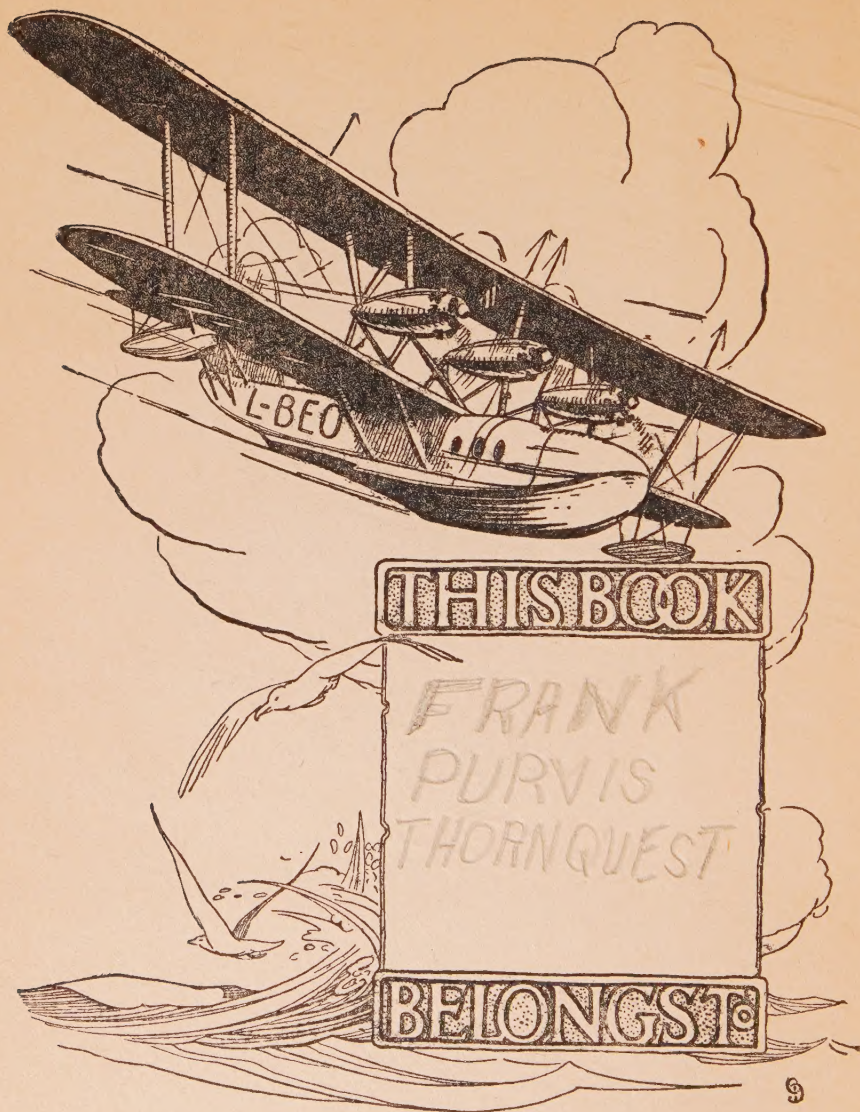












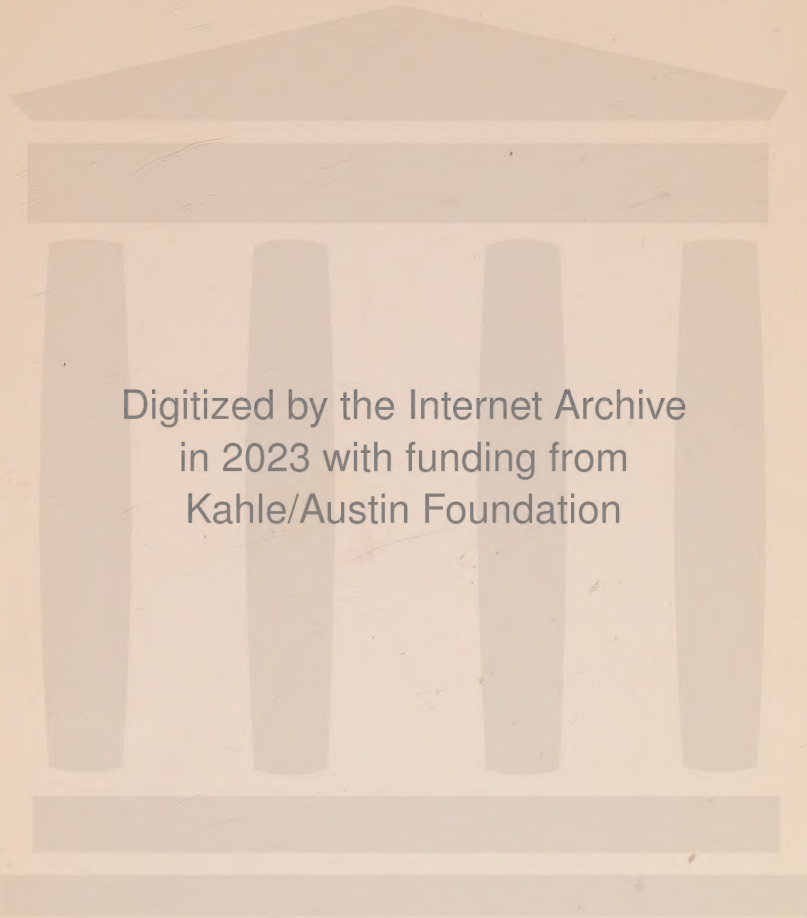


THE BOOK OF AIRPLANES

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### Among the Carpathians

(Luft-Hansa Junker, all metal, 27-seater, twin-rudder type)



# THE BOOK OF AIRPLANES

BY

LIEUT. COMM. J. W. ISEMAN

AND

LIEUT. SLOAN TAYLOR

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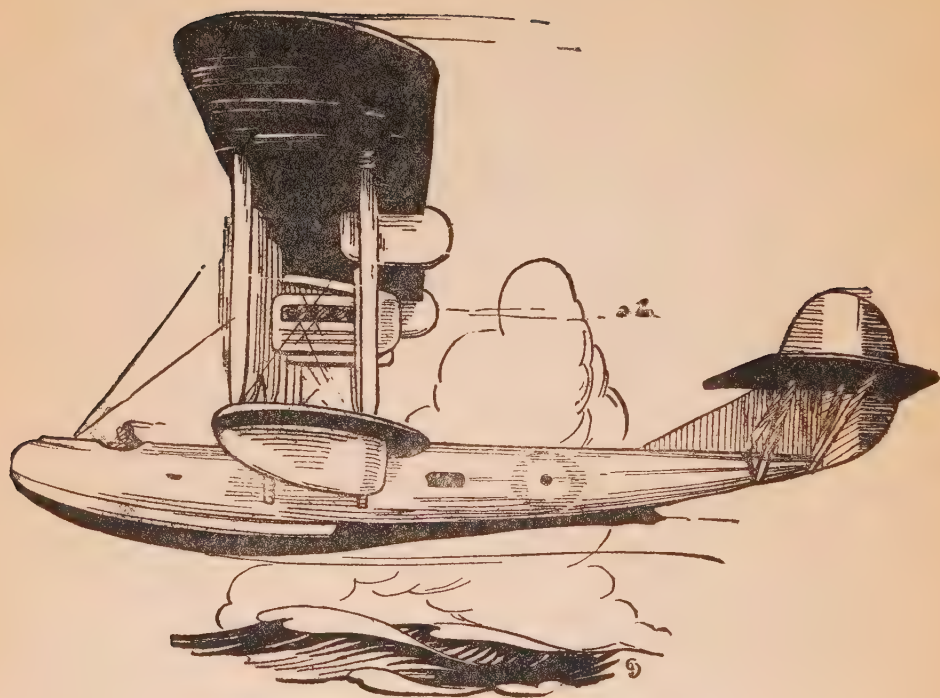
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## FOREWORD

THE collaborators wish to acknowledge their debt to Mr. G. G. Jackson on whose book this volume was based.

No nation should be without its "boys' history of flying" and the authors of *The Book of Airplanes* have prepared this book for American young men with the hope that it will interest them in a great art.

THE AUTHORS.







## CHAPTER I

### STORIES FROM THE ANCIENTS

**M**EN have always wanted to fly. Throughout all the ages and all over the world, men have watched birds with envy and awe. The mystery of flight led many of the ancients to worship the winged beasts and fabulous birds of their folklore. Even in our modern times there is a trace of this admiration and nations have adorned their emblems with eagles.

The struggles to conquer the domain above man's head, that region in which the feathery tribes wheeled about with such tantalizing ease, cover more than 3,260 years of recorded history and legend. But not until this century had dawned did it seem that the fowls of the air would have to yield their supremacy to man-made flying machines.

There had been balloon ascensions, some questionable dirigible flights, and a degree of successful gliding. All of these, however, were almost entirely at the mercy of the elements. But the bird was master of his speed, direction and altitude.

Finally there came the first successful "man-carrying, power-driven" airplane flight. The story of that flight, how Orville Wright,

lying flat in a plane only little bigger and not much better than the models boys build today, ran along the sand at Kitty Hawk, North Carolina, and rose in the air for eleven seconds, will be told in detail farther on. The point here is that after more than thirty-two and a half centuries mechanical flying was at last successfully headed in the right direction.

It wasn't long afterward that man-built planes were flying many times faster, higher and longer than any bird of the 13,000 species that inhabit the earth. It is strange to note, however, that although planes can outstrip their feathered rivals in speed, altitude and duration, there remains one thing in common. In air manoeuvres their contortions are almost identical.

There are many of us who have never thought of a bird doing the flying "stunts" our birdmen do in their planes. Well, next time you go to a flying field note carefully the motions of a plane when the pilot puts her through wing-overs, Immelman and split-S turns. Observe how he executes slips, banks and stalls. Then watch some pigeons or gulls. This comparison will interest and amuse you. You will see those birds do not only the "stunts" just mentioned but they will also do regular airplane spirals and glides and even "squash in" for a landing.

The ancient experimenters, in spite of their great error in other branches of aeronautical theory, were wise in their study of birds in flight. Foremost among these, perhaps, was Leonardo da Vinci. That great painter, sculptor and engineer took up "aviation" experiments about the time Columbus brought the news back to Spain that he had found another route to India.

Leonardo worked out a theory of wing curves and built an "airplane" that was sound in principles. He even equipped it with a tractor propeller. But this, operated by hand, lacked power. If he could have found a means of greater power his plane would have flown.

Leonardo never missed an opportunity to observe birds in the air. He was forever stopping in the street to watch them and to make notes of what he saw. Modern fliers wonder what Leonardo jotted down when a sparrow, making for a hedge, stretched out its



wings and zoomed till it reached the stalling point at the exact moment its tiny feet grasped a twig. Or how he recorded the split-S turn of a pigeon that started to land on a roof gutter but suddenly turned back.

But the keen Leonardo was by no means the first flight experimenter. The legend of Icarus, a youth of ancient Greece, goes back more than 2,800 years before the great Italian.

This young man attached wings to himself with wax and leaped from a cliff. But he was in the air a very short time when he shed his wings, as the modern aviator would say: that is, his wings came off. The legend tells us that the sun melted the wax and poor Icarus was dashed to pieces on the rocks at the base of the cliff. The ancients named a sea after the adventuresome youth.

In modern times, we preserve the memory of our airmen by giving their names to flying fields. Mitchel Field, Long Island, is named after James Purroy Mitchel, a former mayor of New York City, who met his death as a flying officer in the army. Langley Field carries the name of a former president of the Smithsonian Institution and one of America's first flying experimenters. The plane he built was flown by Glenn Curtiss several years after Langley's death. Wilbur Wright Field, near Dayton, Ohio, is named after the elder of the famous brothers; Chanute Field, after the first American glider; and so on.

Icarus' tragic attempt to fly was followed by an experiment by another Greek named Archytas. He built a "wooden pigeon" in 400 B.C. From accounts that have come down to us the "wooden pigeon" behaved like one but Archytas lived to tell the tale and stay on the ground thereafter.

The amusing stories from the ancients are worth looking over not only because of their freakish futility but also because we can see by them how slow and tortuous was man's rise from centuries of "grounded" existence.

The information on many of these stories is very vague and we do not put much faith in them although we read them. Among these is Simon the Magician, who is said to have flown for Nero; Elmerus, the English monk, accredited with having flown a furlong from a

tower; and Besnier, the French locksmith, reported to have flown with a glider propelled by flapping devices.

In the field of balloons we are told that a Chinese aeronaut made a balloon ascension as a part of the festivities when Fo-Kien was crowned emperor. Other flying stories from Cathay,—that is the old name for China,—were brought back by Marco Polo in 1271. This early rover somewhat taxed the credence of his audience, however, when he described “priests sitting in mid-air.”

Another claim for balloon honors is made by Czechoslovakia. They say that a fearless fellow by the name of Fucik went up in a balloon filled with fen gas in 1760. Fen gas is described as a natural gas rising from swampy lands. Francisco de Lana, although he never attempted flying himself, worked out a theory whereby four globes from which the air had been drawn would navigate through the sky.

From these theoretical and more or less folklore reports of lighter-than-air flights we move on to the first historically authenticated balloon ascension, that of the Montgolfier brothers, two French paper manufacturers. But before studying their flight, man's first actual ascension, it will be interesting to note some more of the earlier heavier-than-air experiment reports.

In 1175, we are told, a man remembered only as the Flying Saracen equipped himself with flowing robes that were sewed to ribs and gave an exhibition before King Comenus. The ribs collapsed and the first Near East aviator was killed in the crash.

Then there was Veranzio of Venice who leaped from the bell-tower of St. Marks, demonstrating the world's first parachute jump. He lived and like Archytas of the “wooden pigeon” went about his earthly business afterwards, ignoring further adventures in the air. Another Italian, Borelli by name, who lived in the time of King Charles II, gave his fellow experimenters something to think about after an extensive study of wings operated by the flier. Borelli revealed that the only chance of success lay in the invention of a machine which would overcome the pull of gravity.

While Borelli was making his calculations along the best scientific lines of the times, a Frenchman named Galien was loosing his

imagination on an aviation project. Galien said he wanted to make a flying town, a sort of Noah's Ark Airship, which would carry no less than 4,000,000 people and their luggage. He dreamed of trans-Atlantic hops, round-the-world non-stop voyages and pole-to-pole sight-seeing trips.

Marquis de Becqueville, another Frenchman but of a more practical turn of mind, built a parachute in 1742 and leaped from a window in Paris with a view to gliding over the Seine. It was a gala occasion for the French Court. Ladies-in-waiting and courtiers were assembled for the demonstration of skill and daring. But the poor Marquis did what our flyers today call under-shooting the field. He fell short of his objective and instead of alighting amidst the gay gathering of nobles he fell in the lap of a washwoman who was about her daily work on the river-bank. The monarch of France then forbade any further demonstrations of this sort.

Just forty years after de Becqueville set all Paris to laughing with his skimming dive across the Seine, two brothers sat before an open fire in the little village of Annonay, France, and watched the smoke curl up the chimney. They were Joseph and Etienne Montgolfier, two brothers who were soon to give the world the balloon. And isn't it strange that in another hundred and twenty one years two other brothers, two Americans, were to give the world the air-plane?

We can picture the Montgolfier brothers silently watching their fire that cold November night. Suddenly Etienne, the younger, turns to Joseph and asks a question that many boys have asked their fathers.

"Joseph, what makes the smoke go up the chimney?"

The older brother ponders. Maybe it had never occurred to him why smoke went up the chimney, but, come to think of it, it is interesting at that.

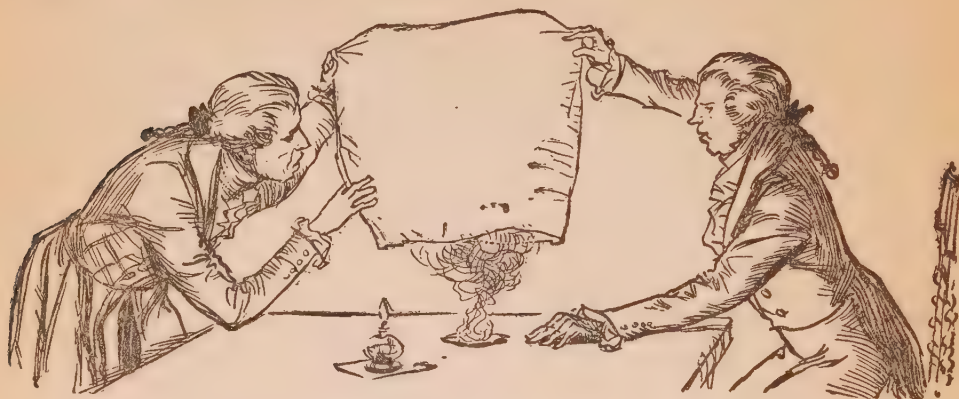
"Hmm. Why, it must be lighter than the air, I suppose. What do you think?"

"That's what I think, Joseph, and I was thinking that maybe we could use that power."

"For what?" It is quite possible that Joseph spoke sharply.



For an answer Etienne filled a small metal tray with coals and placed it on the table. Then he got a paper bag and held it over the glowing heat so that the hot air filled the bag. When he released the bag it rose in the room. Joseph was on his feet in an instant, amazed and excited. He had witnessed the first balloon demonstration.



Later on these brothers made more experiments together, seeking some means of keeping the paper bag in the air. They were sons of a paper manufacturer so it was easy for them to make a large bag for their next test.

This time they went outside. The bag went up, but very rapidly the air cooled, and down it fell. What could be done? Said one of them: "If we can keep the air inside heated, I see no reason why the bag should not continue ascending until lost to view." They put on their thinking caps.

"I have it," one suggested. "Let us get a small metal dish and place upon it some burning charcoal, tie the mouth of the bag to the dish and see what happens." Up went the bag, and as long as the charcoal remained alight it went on ascending. Then when the hot air cooled, down came the bag.

There was one thing which the brothers Montgolfier had not been quite sure of. They believed that their success had only been possible because the charcoal made a certain kind of gas—they did not, at first, believe that it was the hot air which was responsible.



OFF IT WENT, HIGHER AND HIGHER

They thought that they had discovered a new gas, and thus for some time they would use only charcoal. Now, though they were wrong as regards what really happened, the brothers were right in theory—it was gas that was wanted for balloons, and not hot air. But, when they decided to build quite a big affair, they still believed that a mysterious gas was lifting the bag rather than hot air. Air expands under heat; the more it expands, the greater distance it will rise, and the greater weight it will lift.

The brothers now made a very much larger air-vessel than the biggest of the paper bags; they made it in the form of a pear, and it had space for 600 cubic feet of hot air, or gas. While we always think of a balloon as the thing which goes soaring upwards to the sky, the name was actually taken from a glass vessel used by chemists, very like a vase with a short neck.

The Montgolfiers thus made not only the first real balloon, but they gave it the name which has always clung to it.

This new balloon was soon the talk of the little village near Lyons where the brothers lived. No longer could they conduct their experiments behind closed doors; people began to be curious, and to talk about these queer fellows, who seemed to want to go heavenward with their strange air bags. Some of the older people still believed in witchcraft, spells, and prophecy. These were the people who hinted that the brothers were in league with the Evil One, and that disaster would come, not only to them, but to everyone in the village. Thus the experimenters were looked upon with no great favor, because, however foolish a story may be, once it is started it gathers speed, is added to, and often altered entirely from what it was when first whispered.

One day when the new balloon was being filled with air it broke away from its moorings and off it went, higher and higher. The villagers were alarmed at first, then curious, and some said, "What did we tell you? There goes that instrument of the Devil, and perhaps those wicked brothers have gone with it." But the inventors were not to lose their favourite child; the air cooled after a height of about 600 feet had been reached, and down came the balloon, limp and dejected-looking, in a near-by field.



The fact that their balloon was strong enough to break away from its moorings and reach such a height spurred the brothers on to still greater efforts. How excited they were! They first planned and then made a huge balloon, which measured thirty-five feet across at its widest point. So certain of further success were the Montgolfiers that they invited the people from all round their village to come to see the big sphere inflated. This new monster took 23,000 cubic feet of hot air to start it on its first journey. The heating of the air was rather a problem at first, but it was mastered. A pit was made in a field and a fire kindled in it, chopped straw and wool being the fuel. Men were given ropes and told to hold on for dear life, and not on any account to let go until the proper signal was made. Little by little, as the air became hotter, the pull on the ropes was greater, until the men felt they could hold on no longer without being dragged upon a journey they dreaded. "Let her go!" came the cry, and almost like a rocket the big balloon shot upwards, going higher and higher until it was just a small speck in the sky.

It is said that the creation of these hard-working brothers actually reached a height of 7,000 feet, and then, the air cooling rapidly, it began its fall to the earth. But instead of coming to the ground in the next field, like the first one, it travelled a distance of a mile and a half.

It was seen to descend by some villagers, who, believing the thing was sent by the Evil One, attacked it with scythes and pitchforks to kill it—which they did, very effectually. The work of weeks was destroyed in a few minutes. One shudders to think of what might have occurred had it carried a passenger; it is quite possible that he might have shared the fate of the balloon!



## CHAPTER II

### THE BALLOON AGE

**T**HE story of the Montgolfiers' wonderful ascent travelled far and wide. Paris heard of it, and Paris said: "We must have a balloon and these gallant men here, for Paris is the heart of France, and France is the greatest country of the world." Not only did the Parisians raise subscriptions to build another balloon—or several balloons if necessary—but some of the interested scientists who studied the question of air-travel, suggested that if the Montgolfier brothers would use hydrogen, their balloon would not only go up, but it would stay up. The brothers stopped at nothing, in their efforts to conquer the air; the new balloon was made, hydrogen gas was produced by the best known method of that day (the action of sulphuric acid upon iron), the balloon was filled, and to the delight of the brothers and the whole of the Parisians, up it went from the famous Champ de Mars.

Men learned about hydrogen from the experiments of an Englishman named Henry Cavendish. He called it "inflammable air." Sir Joseph Black, another British scientist, had already said before the Montgolfier brothers proved it that bags of hydrogen would rise from the ground. The Montgolfiers also proved something else when their balloon sailed up in Paris.

Up and up went the big bag of hydrogen until it was just a speck in the sky. Then it came down rapidly,—it was in pieces. Another milestone had been reached and passed. The balloon had been torn to ribbons when the gas exploded high in the air.

The higher up hydrogen goes the more it expands. This, of course, the Montgolfiers did not know, or, at least, they did not prepare for it by cutting a hole in their bag so the expanding gas could escape. But only by experience can lessons be learned, and there has never been such an exacting schoolmaster as the air.

Another balloon was made, one large enough to carry passengers. But no one cared to go. That is not surprising when we recall that the first balloon was attacked by peasants armed with pitchforks and the second exploded in mid-air. The people in Paris enjoyed their health too much to risk it in the world's third balloon flight. So the Montgolfier brothers went to a farmyard for their passengers. They caught a sheep, a rooster and a duck. At first they were going to add a hen to this happy party but they let her off.

The new balloon was shaped large and rather like a melon, and it was to be raised by hot air. Also it was gaily decorated. The setting out was a fête-day—Paris was always fond of such days, and here was the chance for another. The King and Queen were there, and they led the cheering as the balloon sailed majestically upward. It travelled bravely for half a mile, keeping well within the view of





the onlookers, and then it came down. There was a rush to see how the poor passengers had fared. Some thoughtful person had placed a supply of food in the basket. What should the daring passengers be doing but making themselves quite comfortable, eating away as contentedly as if the wicker basket were a secluded corner of the farm! One report, however, says the cock had a fractured leg, caused by the descent, but this is unlikely if the sheep escaped whole.

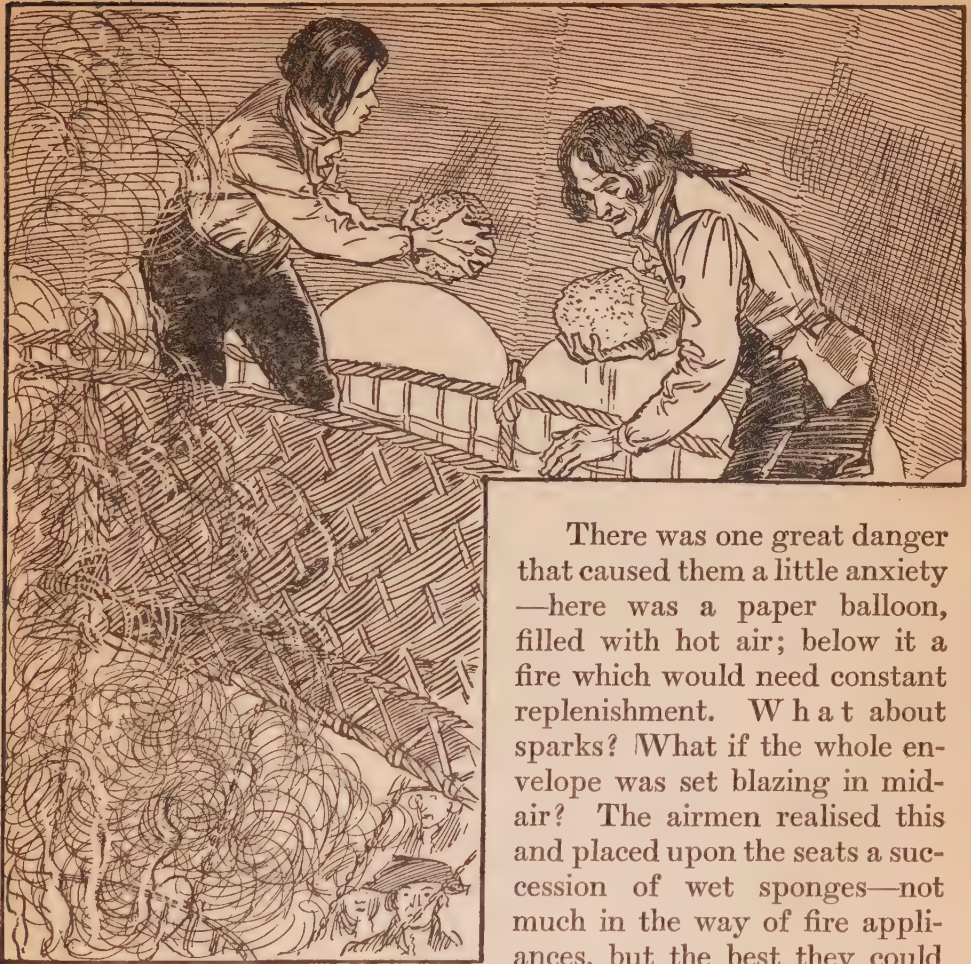
We can imagine how great was the excitement. These Colum-buses of the air had ventured and returned—what next? King Louis had a brain-wave.

“There are two fellows lying under sentence of death, are there not?” he asked of one of his officers.

“Yes, sire—two.”

“Then send them up—let them be the first airmen. If they come down safely they shall be pardoned; if not—well, the guillotine will be saved some work!”

But there was no need to send up unwilling criminals when men were ready and anxious to make the attempt. Said one who was present, “Shall vile criminals have the first glory of rising to the skies?” To this there was no reply, so brave Monsieur Pilatre de Rozier went on, “The honor shall be mine. I claim it now before you all.” Tremendous applause greeted this announcement, and we can imagine M. Rozier being clapped on the back as a man worth knowing. Another brave fellow, the Marquis d’Arlandes, begged to be allowed to join M. Rozier, and his help was gladly welcomed. Work was at once begun on a tremendous balloon, which had a mouth 15 feet across, and was stated to be as high as a church tower, and around the mouth was fixed a kind of gallery of wickerwork, a yard wide, for the accommodation of the two intrepid passengers. An iron brazier was secured with chains right below the opening, the idea being that the hot air should be replenished as it cooled. The airmen wisely decided to make some experiments with their balloon as a captive before finally launching it into the unknown ocean of the air. These captive ascents were quite satisfactory, and with each the courage of the balloonists, already very great, grew steadily. Test pilots of our day must be of this same daring.



There was one great danger that caused them a little anxiety—here was a paper balloon, filled with hot air; below it a fire which would need constant replenishment. What about sparks? What if the whole envelope was set blazing in mid-air? The airmen realised this and placed upon the seats a succession of wet sponges—not much in the way of fire appliances, but the best they could do. It turned out to be a wise

precaution, since the constant feeding of the fire caused sparks to fly aloft, helped by the action of the air as they passed through it, and the sponges were dabbing away almost continuously.

We can imagine the huge crowd which assembled for the start of this the first air voyage in which the crew was to be human. Up shot the great envelope, and quickly rose to a height calculated to be 3,000 feet. It was caught in an air current, and then began to travel

slowly along. This was on the 21st of November, 1783—a date for ever historic in the annals of the air, a date to rank with those on which the Wrights made their first airplane flight, with that when Blériot made the first Channel crossing, and with Lindbergh's thrilling solo hop to Paris. These two airmen, in the fragile-looking balloon, needed courage and nerve of a high order; they were venturing in an untried ship on an untried ocean; below them lay Paris, and death if they made any mistakes in their voyaging.

Once they came near to disaster. The balloon began to fall with great rapidity, doubtless due to the altitude cooling the hot air.

Hastily they fed their fire, and the danger receded, only to be succeeded by another: there was a sharp bang, something had happened—they knew not what. They expected to find themselves at least on fire, if not in quick descent. It is probable that what they heard was the quick expansion of a fold in the balloon caused by the extra heat they were now generating, but we can imagine how tried were their nerves.

It was all very wonderful, and it was a good thing for these gallant fellows that their hands and heads were kept busy. To have gazed at the quite near Paris roofs, and at the Seine, to which they approached very closely on one occasion, must have affected their nerve. It was not like looking over the side of the basket of a modern balloon; instead an open space was at their feet. This first balloon voyage, with human passengers, occupied 25 minutes, and the distance travelled was almost exactly 5 miles, so that the rate was 12 miles an hour, equal to that of the very fastest stage-coach of that day.

With that flight of Pilatre de Rozier and Marquis d'Arlandes began what we should call the balloon age. This lasted, we might say, until the first airplane flight, December 17, 1903. Then began the era of airplanes, but during the hundred and twenty years between, men tumbled in and out of their clumsy balloons in mishaps that were sometimes fatal.

The explorers of the air seemed to enjoy themselves, too. They tried all sorts of strange flights and they built balloons in an amazing variety of styles, shapes and colors. The designs ran from the



shape of a man to that of a fish. Some balloonists tried to use oars and flappers while the more visionary inventors had the idea that eagles could be hitched to balloons as a means of "driving around."

As the popularity of "ballooning" spread over Europe a rivalry sprang up between the Montgolfiers, who believed hot air balloons were the best, and J. A. C. Charles and the Robert brothers (here we have two more brothers as important contributors to the science), who declared that gas balloons were superior. Victory finally came to the gas balloon. It is interesting to note, however, that the first gas balloon flight fared as badly in the hands of the startled peasantry as did the Montgolfiers' experiment.

This new balloon was to be merely experimental, and not for the conveyance of passengers. When the time came for it to ascend, ascend it did, with a wonderful speed. Then it is supposed the high altitude caused a burst, or leak, for it came down quickly, fifteen miles away, in a field where there were many peasants working. These poor folk knew nothing of the previous attempts at air travel, and they fled from the aerial monster. There it lay in the field, the escaping gas giving it the semblance of a heaving and breathing monster.

"What is it, and where has the beast come from?" was the question on many lips.

At last one fellow, bolder than the rest, fetched his gun, took deliberate aim and so put the stricken "beast" out of its misery. Certain that his shot had taken due effect, and that there was no danger of attack, the man led his friends towards the envelope, now very much smaller than when it first touched the ground. Pitchforks were again made use of, and a horse was brought up, to which the balloon was attached and dragged in all directions until there was nothing left of it but scattered pieces of silk on hedgerow and bush!

Once again the countryfolk had prevailed against the force of progress, and now the French Government undertook to tell its people about the experiments that were being made, and that there was not the slightest need to kill every balloon that came floating their way!

There could be no pause now, and an envelope of silk, double the size of the one just described, was made, covered with netting, and to this was attached a kind of boat. On a winter's day in 1783 two intrepid airmen embarked upon the well-filled balloon, which was now provided with a valve to let out the gas should it be necessary. The airmen also carried ballast, and a barometer to test their height. In all essentials they had now produced the modern balloon, very few changes having been made in the succeeding years.

The ascent of this balloon was quite an event in French life. One of the Montgolfier brothers was there with a small hot-air balloon, which he let loose in order to test the direction of the wind. Then the makers of the balloon stepped into the car, and amidst a hush, followed quickly by a great cheer, off they went, shooting up to a height of 6,000 feet almost immediately. At length they decided to come down again, but no sooner had M. Roberts stepped out than M. Charles said that he would go up again. Lightened by the weight of a man, the balloon shot up again to a height of about 10,500 feet. The sun had set by this time, and many people thought that the airman was very foolish to go up and remain in the air in darkness; but once up, Charles was so fascinated that he forgot the darkness and the cold and stayed up until the sun rose again. But now the cold was intense—remember it was mid-winter—and the rarefied air was giving Charles violent head pains; he therefore pulled the valve, so that the balloon sank steadily to the earth. He made a perfect landing, some seven miles from the spot where he had started.

The process of filling this hydrogen balloon was very interesting, though it caused an enormous amount of trouble to the balloonists.

No really rapid method of making hydrogen gas had then been discovered. The first step was to erect poles with which to make a kind of gallows, under which the balloon could be suspended. From the top of the gallows a hook held up the top of the envelope, which now hung quite limp. Grouped round the gallows were several casks containing zinc and iron filings, treated with diluted sulphuric acid. The action of the acid on the metals gave the hydrogen, which, collected in pipes, was led by flexible tubes to the mouth of the balloon. It took hours to fill the balloon, and the process was expensive.

Even so, it was better and easier than the process of filling the hot-air balloons. The poor attendant in the latter had to stand inside the envelope to beat out the flames whenever they caught hold of the flimsy material of which the balloon was made. Fortunately the filling process was not the same long-drawn-out affair as with hydrogen, but too often the poor fellow came out of the hot air in a lamentable condition, choked by smoke and almost overcome by the heat.

There is a tale told that when the brave balloonists had completed their first real trip they were seized by order of King Louis and put into prison. For what reason do you think? Because they had risked their lives! This was a strange turn in fortune, seeing that they had received direct encouragement from His Majesty! They were soon set free, however, for we know that shortly afterwards they were all busy on further air-work, and later on one of them was granted a pension of about \$1,000 a year, in reward for his efforts.

This conquest of the air was, in some ways, the greatest event of the eighteenth century, and it was not long before the story was known throughout the civilised world. Prophets arose who predicted that very soon we should know all about the stars, because they could now be visited, and some even believed that the balloon was the direct way to Heaven itself!

The gas balloon was given a name—the Charlier—and both this and the Montgolfier, which was the hot-air balloon, were now making constant ascents, and all with safety. The mania for ballooning spread to Britain. The very next year (1784) an Edinburgh man named Tytler made several short voyages with a Montgolfier type of balloon. Later in the same year London had its first air thrill. A young Italian, Vincent Lunardi, was eager to make an ascent by means of a Charlier, but he was very poor. By his eloquence he persuaded many good people to put their money towards a balloon for the credit of England. He arranged to make his first ascent on a September day, when a crowd, estimated at 150,000 people, clustered round the slowly inflating balloon. As is so often the case, gas was short, for the method of generating it was far from perfect, and the story went round that Lunardi did not intend to make the ascent.



The mob began to growl out threats—they thought that the whole story had perhaps been a hoax. Lunardi was a brave fellow, however, and he did not intend to disappoint his patrons. When he saw that the envelope would not be filled sufficiently to carry the load he had arranged, he dismissed his assistant, obtained a lighter car, and then cut the ropes. Up went the partially inflated balloon amid the cheers of thousands, who did not think of the risks they were compelling the young airman to take merely in order to gratify their pleasure.

King George the Third was busy with his Council when he heard the cry in the street below that a speck in the sky was none other than the balloon and its captain. Out trooped the King, his Council attending. Said he, "Come, our deliberations may wait, but we may never see this poor fellow again."

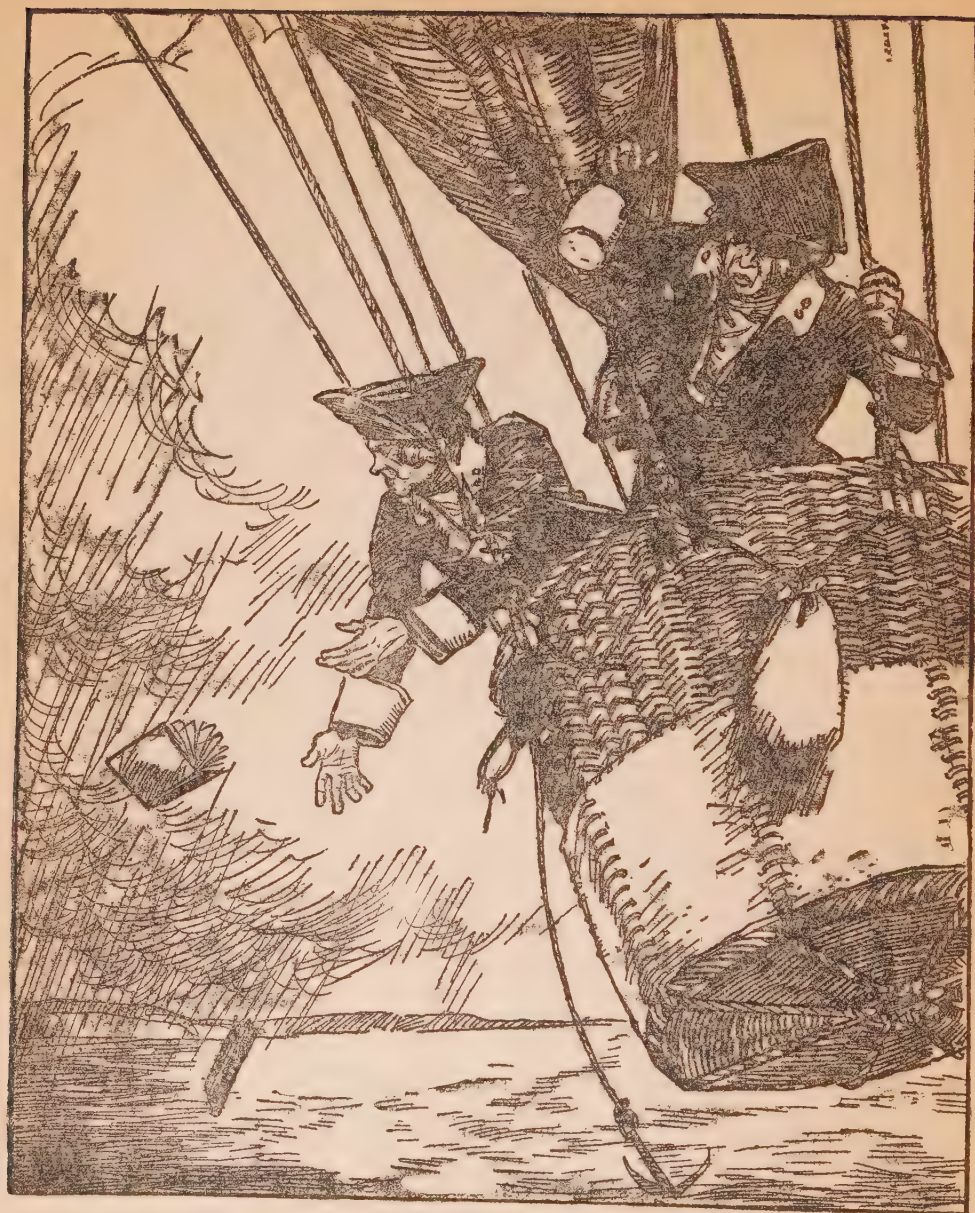
Soon Lunardi and his balloon were clear of London, going north, almost following the Great North Road. It was intensely cold, and although it was only September, the mouth of the envelope was frozen, and the aviator had some difficulty in opening the valve in order that the pressure of the expanding gas upon the silken envelope could be relieved. Although he could not take a human being for company, owing to the only partial inflation of his envelope, he did have a couple of passengers—a dog and a cat. The dog took the voyage with good-humor, but poor pussy was in a terrible state. She wanted to get out, and for her sake, as much as to test the capabilities of the balloon, Lunardi opened the valve and dropped to earth. A country-woman was near, and she timidly approached when hailed by the brave fellow, and was considerably taken aback when he placed a live cat in her arms, begging her to take care of it. Then, before she could reply, Lunardi threw out his ballast, and up went the balloon again for another short trip. When he felt that he had done as much as he had claimed—and considerably more than he had hoped—Lunardi opened the valve once more, and descended, quite comfortably.



### CHAPTER III

## FAMOUS BALLOON VOYAGES

**E**VENTS now began to move rapidly in the balloon world, and soon airmen were casting eyes upon the silver streak of sea which divides England from France. It was the Frenchman Blanchard who decided upon the attempt, and he was joined by an American named Dr. Jeffries. They ordered a Charlier, and decided that Dover offered the best chances of success as a starting-place. Early in 1785, on a cold day, they started off. The intense cold affected their gas, and soon, to their dismay, they found the balloon making for the water level. There were no fast steam-tugs or destroyers then to accompany the airmen and take them off in case of danger; their lives were in their own keeping, and escape from the basket of an early balloon was always a difficult matter. In the first place it would not float, and even if it had been able to, the weight of the envelope overhead would either have upset it, or smothered the unlucky occupants. Of course they carried ballast, which could be used for the purpose of lightening the balloon, and this was thrown overboard. Still the balloon sank until it seemed that they must be lost. Over went their books, their instruments, their anchor, and, indeed, anything they could catch hold of. And still the balloon went down instead of up. There was only one thing



OVER WENT THEIR BOOKS, THEIR INSTRUMENTS, THEIR ANCHOR



they could throw over now—their very clothes, and these they began to strip off as quickly as possible. Some of the garments had actually gone, when the balloon, for some reason that the airmen were always unable to explain, suddenly shot upwards to safety and to France. After drifting a little distance inland, it was brought successfully to earth after the most thrilling air-voyage so far attempted. The Channel was crossed!

The excitement was great, and ballooning received much encouragement from this successful trip, just as about a hundred and twenty years later the first crossing of the silver streak, by the airplane of Blériot, marked the real turning-point to success for the flying-machine.

Eight years after Blanchard crossed the Channel he came to the United States and made the first balloon voyage in the New World at Philadelphia. No doubt his decision to visit us was due to the insistence of his American friend and flight companion, Dr. Jeffries.

By now hundreds of ascents had been made, and none of them had proved disastrous to the bold voyagers, so that great confidence in ballooning was to be found. This confidence, however, was to receive a rude set-back by the loss of one of the best and bravest of the first airmen. You will remember that M. Pilatre de Rozier was first upon our list for his successful trip in the Montgolfier balloon. This intrepid man decided that he, too, would cross the Channel, and, remembering the difficulty that met the efforts of his French friend and the American, Rozier decided that he would combine the advantages of the Montgolfier type with those of the Charlier; in other words, under the envelope of the Charlier—the balloon dependent on hydrogen—he suspended a Montgolfier hot-air balloon. Today we understand how really dangerous is the hydrogen-inflated envelope of the airship. Germany lost ship after ship in the earlier stages of her Zeppelin experiments from the setting on fire, or the explosion, of hydrogen by lightning alone. How strange it seems that there was no one to tell poor M. Rozier that he was doomed from the start! But little was known about such things then, and the brave fellow set out. Very soon, of course, the hot air caused the

hydrogen to explode, and the end came in a moment, the gallant airman being dashed to pieces.

This terrible disaster was unfortunately followed by others in quick sequence. In each case some rule of safety was broken, resulting in disaster. Following quickly upon the loss of M. Rozier, another Frenchman made his car too shallow, and, leaning out, he fell overboard and was killed.

An Italian nobleman came down in a tree. He was using a Montgolfier type of balloon, and it was set on fire by the furnace carried underneath the envelope. In his fear of being burned, the Count jumped out, and falling to the ground was killed instantly.

Madame Blanchard, wife of the cross-Channel airman, went up in a balloon one night to let off some fireworks over Paris. By some means the fireworks ignited the envelope of the balloon, and in a burning mass it came swiftly down, the gallant Frenchwoman losing her life.

From fatal accidents let us turn for a moment to some marvellous escapes. In 1808 two Italians made an ascent from Padua, using a Charlier type of balloon. They had reached a tremendous height, estimated at 30,000 feet, when the envelope suddenly burst, and the balloon came hurtling towards the ground at express speed. The airmen felt that their last moment had come, and prepared for death. But as the balloon descended, the upper portion of the envelope became converted into a parachute, checking the fall to such an extent that the car landed lightly, and the occupants escaped with only a slight shaking. This kind of descent, following a burst, has occurred several times, and many a serious disaster has been prevented by the action of the air on the remains of the envelope.

A well-known balloonist, named Sadler, had a wonderful escape in the Irish Sea. He had planned to travel by air from Dublin to England. His first trouble came in the discovery of a rent in the envelope. To repair this he had to climb into the netting and tie up the hole with his necktie. Then as he approached the Welsh coast and made ready to land, the wind veered round and blew him out to sea again. Seeing five ships quite near to him he decided to descend and ask them to take him off. Letting out the gas he came almost to the

surface of the water, and then, to his surprise, he saw the ships making off, probably not understanding his desire. By throwing out ballast he got up a little distance, but still the wind would not waft him to land.

Three ships appeared beneath him now, and he signalled to them to come to his help. They understood and made for the balloon. He came right down into the sea now. Again the wind played him a trick, and, catching the envelope with all its force, it dragged it along the surface of the water at a terrific speed, quickly leaving the vessels well behind until it seemed that Mr. Sadler must again take to the air, and look for succor elsewhere. He decided that it would be better to take the help nearest him, and therefore released the gas from his balloon. This crippled the balloon so much that it was no longer able to support the car, which began to sink. The poor airman had to abandon the car and climb on to the netting of the now almost deflated envelope. Often the sea swept right over him, and he knew that his death was certain from the numbing cold unless help came speedily. One of the ships now came up, but the captain was afraid of getting entangled in the netting of the huge affair. For a time Sadler could not make the captain understand what he wanted him to do. It was to run the bowsprit of the ship right into the envelope of the balloon, and so stop its progress, at the same time allowing the airman to climb up on to the ship. Seeing that unless something like this was done, no rescue could be made, the captain took the risk of entanglement with the sinking balloon, and ran his bowsprit well into the netting and silk, and, almost at his last gasp, Mr. Sadler was rescued. From this has sprung a tradition of the sea—give whatever aid possible to flying men.

We often hear of family tradition, and here we have a good case. The father having failed, the son felt that it was up to him to attempt the crossing of the Irish Sea—always treacherous from the balloonist's point of view. The son, Mr. Windham Sadler, chose the same starting-place, and, in 1817, after a voyage lasting about five hours, and estimated at seventy miles, he landed on the Welsh coast. Sad to say this young man, like so many of the early air-voyagers, lost his life in a balloon accident seven years later.



In the meantime, while serious fliers and scientists were pushing ahead in the study of aerostatics and sportsmen fliers were having the time of their lives, the kings who ruled Europe had not overlooked the balloon as a possible engine of war.

The war lords must have mapped out great things for the balloon, but they were doomed to disappointment if their plans included bombing and troop transport. Even in the World War, after years of testing the big gas bags under all sorts of campaign and actual conflict conditions, their service was limited to checking up on the enemy's movements and observing whether the artillery fire was hitting the right places.

It is odd, then, that the first war use of a balloon was for observation. General Jourdan, commanding the French in the battle of Fleurus on June 26, 1794, sent up a balloon on the end of a rope with a man named Coutelle in the basket. The information gained by Coutelle helped the French to win.

We have seen that so far two kinds of balloons had been used—the Montgolfier and the Charlier, which means the hot-air balloon and the hydrogen gas-filled balloon. Both, as we have seen, were dangerous. Now came Charles Green to prove that the balloon would be much safer and less costly to fill if ordinary coal-gas were used.

Green made his first real voyage at the Coronation festivities of King George the Fourth of England in 1820. This was the beginning of a very successful career for the gas-filled balloon wherever it was used. Though coal-gas had not the same lifting power as hydrogen, it was found that, by largely increasing the size of the envelope, the same work could be attempted. Mr Green was soon engaged to undertake the building of, and to make ascents with, what was called the "Great Nassau Balloon." It stood eighty feet high, took 90,000 cubic feet of gas to fill, was made of crimson silk, and would carry, in safety, twenty people. All in all, it was a magnificent piece of work.

Paris likes to have every novelty, and they soon asked that the "Great Nassau" should be sent to France for exhibition. It was a big thing to transport such a distance, and there seemed a chance



THE "GREAT NASSAU BALLOON"

that the French would have to sigh in vain for the famous crimson balloon, about which all Europe was talking. There were, however, a few adventurous spirits who proposed taking the balloon across the Channel in the only possible satisfactory way—that is, under its own power. A wealthy young man, named Holland, came forward to say that this

was the very adventure he had been seeking, and, providing someone would go with him who understood all about the balloon, he would be very glad of the opportunity of taking it to France. At once its designer, Mr. Green, stepped forward, and when a third person was wanted, Mr. Monck Mason, a close friend of Holland's, went along, too.

With such a large and powerful balloon, there was no knowing where such a voyage might end, and the Boy Scout's motto, "Be prepared," was therefore obeyed in real earnest. Provisions to last a fortnight were laid in, and no less than a ton of ballast was stowed in the car. It was decided to start as soon as the wind was favourable

for France, the time of the year being November. The airmen carried some small parachutes, which could be dropped as required to tell the inhabitants below how they were faring, and to send messages to the mayors of cities and towns over which they might pass.

They had left London late in the afternoon of a November day with the idea of voyaging slowly through the night, so that the advantage of daylight might be had for the hoped-for descent in France. Before darkness fell they saw beneath them the white crests of the waves of the English Channel, and then they drifted straight into a fog, which blotted out everything; they were cut off from the world in a way that only airmen can be. The man on the land can grope his way along, sure at least of the earth beneath his feet; but the airman must go on without knowing where he is, fearing to land.

For about an hour this sea-fog held them, and they had to trust to Providence as regards their drift, and also as regards their height above the water. To their great joy and relief the fog cleared as quickly as it had come, and below them they saw the lights of a town, which they judged must be Calais, on the coast of France. On and on they went, obtaining occasional glimpses of villages and towns beneath them. Then came fog again, and for hours they were lost, suffering considerably from the intense cold. Once they found themselves perilously near the earth, but as it would have been dangerous to attempt a landing in the fog and darkness, they threw out some ballast, and up shot the balloon to a height which could not have been less than 12,000 feet. Followed a series of sharp explosions from the huge envelope above them, and they prepared for the worst. Surely the envelope had burst! But, to their surprise, the balloon continued its journeying instead of beginning to fall rapidly as they expected.

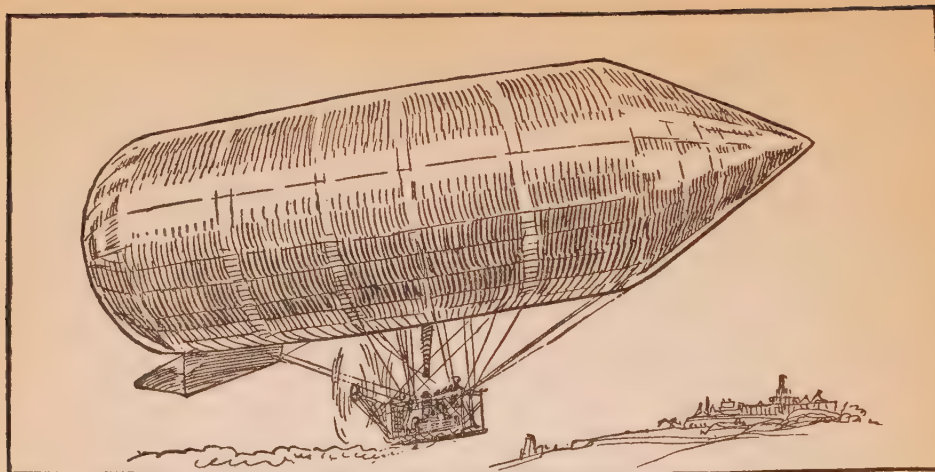
What was the cause of the explosion? Quite a simple one really. Jack Frost had been at work with the ropework of the netting. As the balloon ascended to the higher regions, the pear-shaped envelope assumed a rather different form—became more like a ball, from the action of the cold air—and naturally when this took place the strain on the netting ropes was altered. Having been frozen, they gave to the new strain, thus causing the sound of explosions.



At last came daylight and the clearing of the fog. They looked over the side of the car, and saw stretched beneath them a low-lying, desolate, forest-like country. Where were they? They did not know; they knew only the direction in which they had drifted, and had no idea of the speed at which they had travelled. They shivered when one of the trio suggested that this was, in all probability, the uninhabited steppes of Russia! Russia was the last country they wanted to see, for not only was it sparsely populated, but what little population there was there would probably be hostile. Remembering what had happened to the first balloons in civilised France, they anticipated its recurring here.

They had now been voyaging for about eighteen hours: to go on would simply mean penetrating further into that inhospitable country, and so they decided to take their chance and descend at once. This they did without any trouble. To their surprise and delight they found that, instead of Russia, they had come to earth in the very country from which the balloon had taken its name—Nassau—a very remarkable coincidence. The German people gave them a most warm welcome, and their trials were at an end, for their hosts considered that a great compliment had been paid to their country by the visit of the brave Englishmen. The voyage was of about five hundred miles—then the record trip for a balloon.

This famous voyage took place in 1836. In the next year the famous balloon was concerned in a very sad accident. In the year following the Nassau voyage, a Mr. Cocking designed a new form of parachute, from which he proposed to descend from the "Great Nassau." It was fastened below the car of the balloon. When a height of 5,000 feet had been attained, Mr. Cocking waved a hearty farewell to the balloonists and cast off. Like a ball from a cannon the "Great Nassau" shot upwards—and the parachute shot downwards; instead of opening more and more, it closed completely, and in a few moments the brave Cocking had met his death in front of the gay crowd assembled to watch him.



THE SCHWARZ ALL-METAL BALLOON

## CHAPTER IV AIRSHIPS

**F**RANCE, as we have seen, gave the world the first balloon. It was also France that gave the world the first airship. Fifty-nine years after the people in Paris had rubbed their eyes to make sure that they were not seeing things when Pilatre de Rozier and the Marquis d'Arlandes sailed over in a balloon, they rubbed their eyes again. And this time they cupped hands to their ears, too, for hanging under a fat cigar-shaped balloon was a tiny steam engine (just three horsepower), puffing away furiously as it dragged the big gas bag through the air.

That was the dirigible, or "blimp," as we should call it now, of Henri Giffard. It was 143 feet long and 39 feet wide. The little engine operated a three-blade propeller. Giffard, a great scientific man aside from his interest in balloons, flew from the Hippodrome in Paris to Trappes at a speed of six miles an hour.

Although Giffard brought his blimp back to earth in perfect safety, his type of craft was not considered a success. In the first place, the steam engine was so heavy for the amount of power it pro-

duced that the ship's speed was cut down too much. Then, there was the danger of sparks escaping from the firebox and setting off the gas above.

How to get enough power was the greatest problem before ambitious fliers. The airship experimenters tried everything they could think of: oars and paddles, sails and flaps, wings and springs and even clock-work machines. A Frenchman, Dupuy de Lome, tried man-power. He loaded eight men aboard his airship and set them to work turning cranks attached to the propeller. These huskies worked with might and main but the craft didn't budge.

An electric motor was tried by Gaston Tissandier, another Frenchman, and he managed to go eight miles an hour. This idea was taken up by the French government and two army officers, Captains Krebs and Renard, set to work and built a really good ship that travelled fourteen miles an hour. But electric motors finally proved to be too heavy for practical use.

In the meantime a German engineer named Paul Haenlein had built and flown a dirigible with an engine that used coal gas drawn by pipe from the overhead bag. That was in 1872 and was getting close to the final secret of airship flying. Germany found it twenty-four years later. It was the gasoline engine!

The gasoline, or internal combustion engine, as engineers call it, was developed by Gustav Daimler about 1886. But it was not used in a dirigible until 1896 when two Germans named Wolfert and Baumgarten took off in a blimp they had built together. Disaster overtook them, however; the dirigible caught fire in the air and Wolfert was killed.

"He should never have used that type of engine under a bag of gas that catches fire so easily," said some of the aeronauts of his time. But it was not long before people all over the world realized that Wolfert had pointed out the right road at last.

"He died for a glorious cause," they said then. "The gas engine is the secret of flight. He was a great man."

Immediately many nations started to build dirigibles in real earnest. An Austrian named Schwartz gave them another idea. He built an airship of rigid construction. The blimps hitherto had been

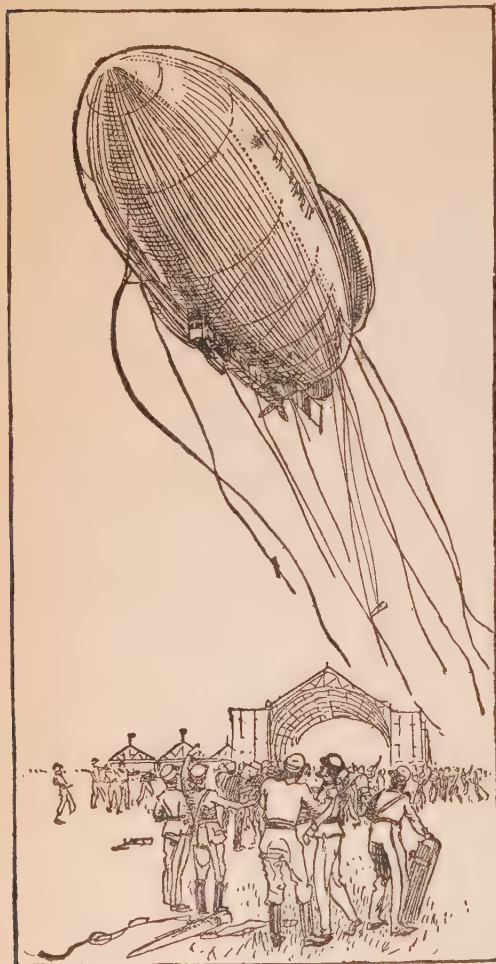


non-rigid, that is the envelope holding the gas was loose. But the Austrian enclosed his balloon in a thin casing of aluminum. He built two ships. One was destroyed while the gas was being put into it and the other after a short flight.

There is no further record of this man attempting to carry on, but the rigid dirigible was soon to come as the finest type of airship we know—the Zep-  
pelin!

But before Count Ferdinand von Zeppelin went back to Germany from the United States, where he had been a balloon observer in the Civil War, and undertook to build his world-startling airships, France was forging ahead at great speed with the non-rigid types. And here, again, we have two brothers working together for the cause of aeronautics, the Lebaudy brothers.

By many the Lebaudy airships—there were several of them—were considered the best of their kind. The first excited universal attention, possibly because of her fine lines and her bright yellow color. She was shaped, as regards her envelope, much like an ocean liner, and possessed



"LA PATRIE"

some rather curious fins, some of them being vertical, others horizontal. A floor of rigid steel tubes was provided for the suspension of the car.

Another, and better, Lebaudy ship was built in 1905, and then came "La Patrie." This ship was the most famous of her class, and her fame was enhanced by her strange fate. She was owned by the French army, and one day, while on a voyage, her motors broke down. The airship descended safely and was anchored. Within a few hours of her anchoring, a strong wind blew, and "La Patrie" began to show signs of breaking loose. The military were called out in great numbers, and the soldiers hung on to her with all their might. But the wind was the stronger force, and, little by little, the airship dragged her clinging men from the site of her anchorage; cables began to snap in all directions, and posts were torn up. Unfortunately, in tilting, she lost some of her ballast. This was too much, and she went completely free. Soon, the pride of the French army was making full speed for England. Then, later, the Irish saw her over their country, and still she went on and was never heard of or seen again, the broad Atlantic probably forming her grave—unless she was able to go on a voyage of exploration to the North Pole. Who knows but that some time our aviators, on a similar quest, may not come across the gaunt framework of this famous airship of the early days?

When talking of aircraft, and airships in particular, there is always one name which must be mentioned—that of Santos Dumont, a plucky Brazilian, who gave all his time to the solution of the riddle of flight.

Santos Dumont wanted to be a flier. As a boy he dreamed and talked about air-liners; as a man he determined to do what he could to make these dreams come true. There was little to be learnt about the air in Brazil, and he looked abroad, deciding eventually that France was the true home of air-voyaging.

Santos Dumont began with ballooning, but this did not satisfy his adventurous spirit, and he turned to the airship, already a rather lusty baby. He built his first airship—a quaint little affair, with the usual sausage-shaped envelope, from which was suspended a small car with a three and a half horsepower motor-cycle engine fixed in it. He had a silk-faced rudder, and for pointing the nose of his airship upwards or downwards he borrowed an idea from the

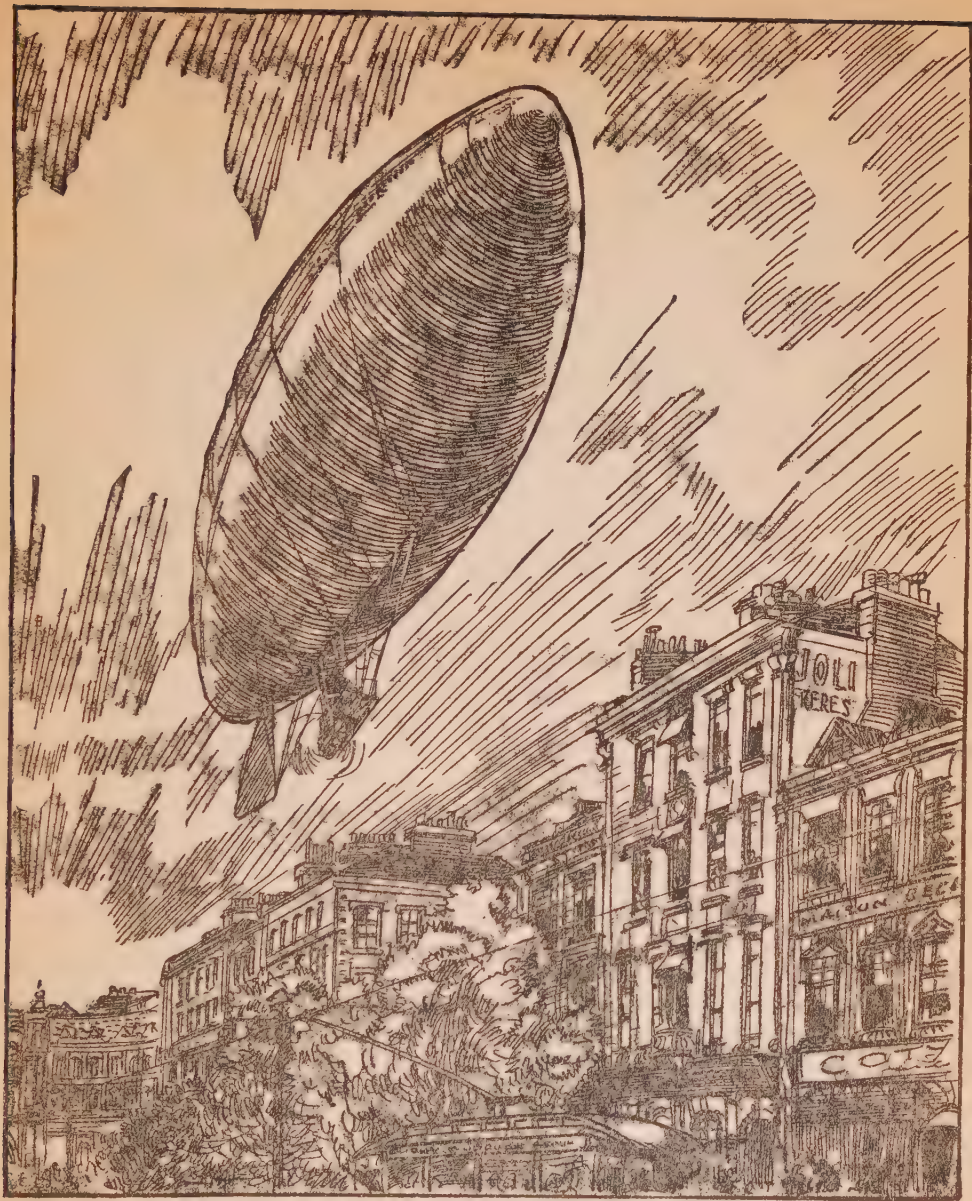
balloon—he carried bags of sand for ballast, and arranged for them to run upon rods. If he allowed them to run backwards along the rail, up went the nose of the tiny ship; forwards, down she went towards her landing-place—quite simple, but most effective, as simple things are so often found to be. This was a splendid start, and the “Santos Dumont I.” fulfilled all its builder’s anticipations. Very soon “Santos Dumont II.” was in being. This new ship had a short life. Under trial, on a very cold, miserable day, the hydrogen shrank so much that the envelope lost its lifting power, and down came the ship before the pilot could get her to a safe anchorage. She struck some trees, and was ripped to pieces. Fortunately the brave Brazilian escaped without serious injury, and at once got to work on “Santos Dumont III.” Here the inventor made several changes: for hydrogen he substituted coal-gas, and he altered the shape of the envelope, making it shorter and broader, with a sharply pointed stem and stern. Then he gave it a keel of bamboo, along which the weights were fixed for elevating or depressing the nose of the ship.

Paris was delighted with No. 3. She did all that Santos Dumont claimed for her, cruising with ease over the city, and circling the Eiffel Tower, which in those days was equivalent to flying the Atlantic today.

Then came No. 4, in 1900, in which further improvements were made. Instead of sitting under the bamboo keel with his engine, Santos Dumont now sat upon it, a little deck being formed by the keel. The horsepower of the original motor was doubled, and the propeller was given a two-bladed screw. A return to hydrogen had to be made, because it had a greater lifting-power. Many other minor improvements were added. It was with this airship that Santos Dumont decided that he would attempt to win the Deutsch prize of 100,000 francs, offered for a trip by an airship from St. Cloud, round the Eiffel Tower, and back in 30 minutes.

On further thought, the airman decided to build a new ship specially for the task, and we find No. 5 setting out on an August day of 1901. Things went so well at first that he hoped for the prize that very day. In 9 minutes from the start he had rounded the Eiffel Tower, and started on the homeward trip; but then his troubles be-





HE WOULD GO FOR A SPIN AROUND PARIS

gan. Somehow or other the valves of the envelope had begun leaking, and a portion of it lay limp, retarding his speed. While he was still plugging away, the propeller caught one of the wire stays, made loose by the deflation of the envelope, and cut it, releasing others, which promised to entangle the propeller. There had been a faint hope that the envelope would last him until the wind had carried him beyond the city, but that hope was soon lost, for the whole ship began to drop quickly, finally falling right across the roof of a big hotel.

Santos Dumont hung suspended between heaven and earth. Any moment the wires holding his car to the wreckage might have gone, and that would have been the end of this most intrepid airman. The fire department sent a hook and ladder wagon to the rescue and firemen helped him down.

One would have thought that Santos Dumont would have been content to leave further experiments to others. Not a bit of it! Within a matter of hours he was hard at work on the details of No. 6!

No. 6 started badly by colliding with a tree, and sustaining serious damage; but this was made good and Santos Dumont was more determined than ever to win the Deutsch prize. In October 1904 success crowned the efforts of this plucky airman. Despite a stiff breeze, which at one critical moment threatened to drive the airship back, she rounded the Eiffel Tower, and plugged her way back to the starting-place, well within the time limit. Although the value of the prize was great, it was the achievement of his ambition that meant so much to Santos Dumont. The money he gave to the poor.

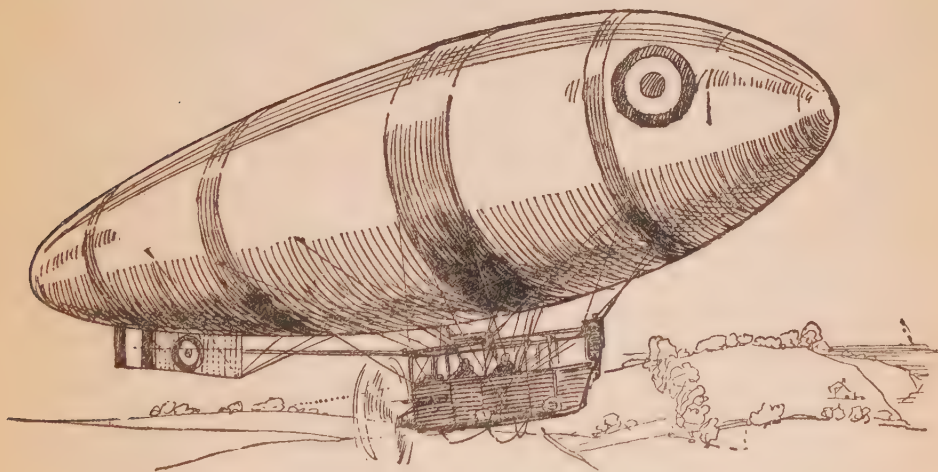
Then came Nos. 7, 8, 9 and 10, No. 9 being the favorite craft of its inventor. This was really a baby airship, being, in fact, for Santos Dumont, what a small run-about is for the man who may possess half-a-dozen big touring-cars.

The story is told that Santos Dumont would set out for a run with his baby airship, come down in a field, or even in a large garden, and drop in for lunch with his friends. Then he would come out and go for a spin round Paris, coming back, most likely, just above the houses in the wide and splendid boulevards. People would hear the purr of the tiny motor in the early morning, jump out of bed, rush

to the window, and there, ambling along the street, would be No. 9, so near to their windows that they could almost touch the well-filled envelope. This ship, and others from the same creator's hands, were often seen over the Mediterranean. They did much to accustom people to the safety and use of the lighter-than-air machine, at a time when efforts were being devoted to the airplane, whose coming we shall soon have to record.

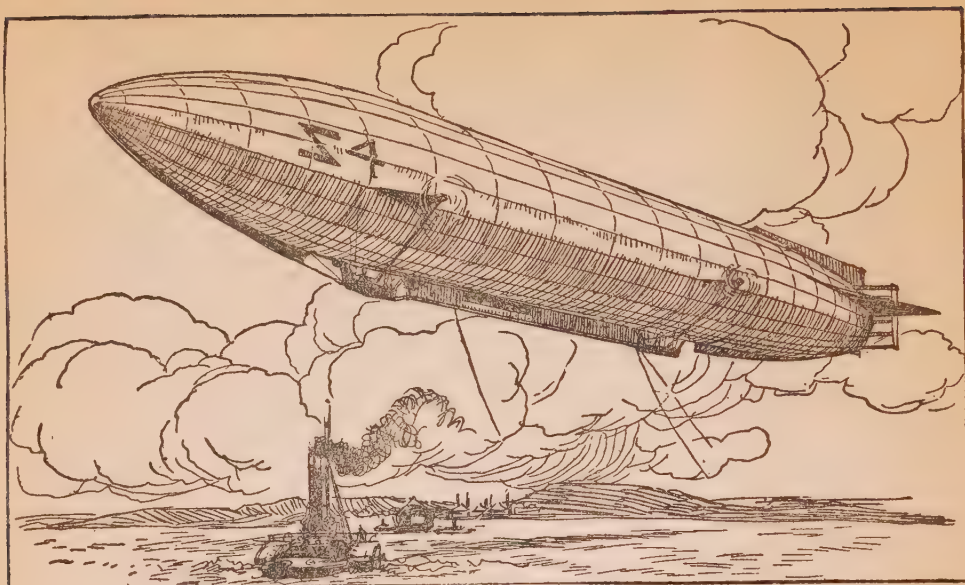
No. 10 was a larger ship altogether, and had accommodation for four passengers.

Now we must turn to the coming of the most famous airship of all—the Zeppelin.



A BLIMP: BRITISH NON-RIGID AIRSHIP





ZEPPELIN NO. 4

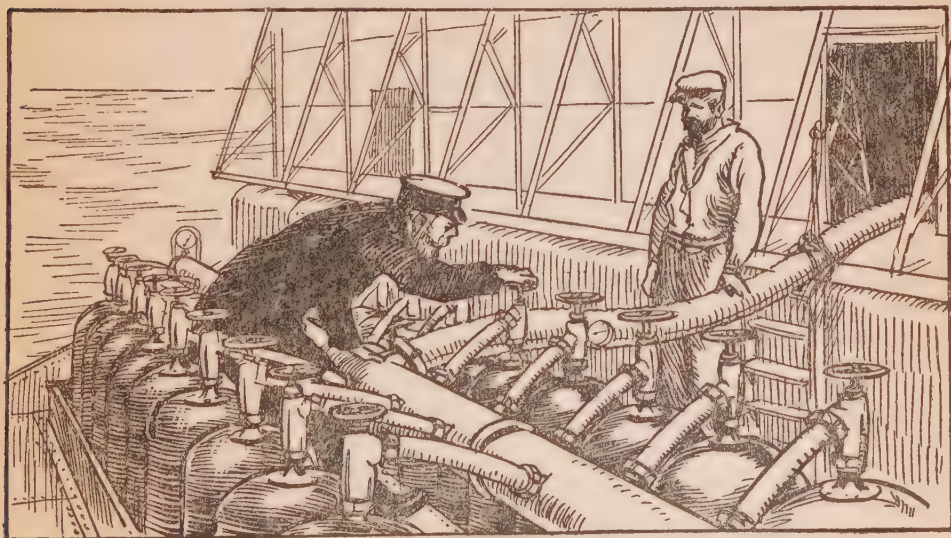
## CHAPTER V THE ZEPPELINS

ONE of the first things Count Zeppelin did was to settle upon a spot for building his giant experimental ship. He felt that it was better to build over water, so that when they began to experiment with the completed ship, there would be no landing-risks—always the bugbear of the early aircraft, airships as well as airplanes.

To begin with, a kind of airship dock was built at Friedrichshafen, on Lake Constance. The dock, like so many of the modern varieties, was of the floating kind, nearly 100 pontoons being used to float the platforms. These latter had a total length not far short of five hundred feet, a width of close upon eighty feet, and a height of sixty-six feet. At one end it was open, though a kind of curtain was strung across to ensure privacy in airship building; at the other were the workshops, offices, and sleeping and living apartments for

certain of the workmen. The dock was so moored that it could be turned round completely if the wind blew from a direction which would have meant some risk in launching the ship.

The envelope, the most important part of the Zeppelin, was not quite the cigar-shaped envelope to which aviators had become accustomed in the experiments already mentioned. True, it was long, and rather slender like a cigar, but it had a conical stem and stern, thus giving it a singularly neat look, and also ensuring the minimum resistance to the wind. The first Zeppelin envelope measured approximately 390 feet in length, and its diameter was exactly one-tenth of the length. The gas chambers were seventeen in number, and (in much the same way as an ocean liner) it would be possible to flood several with air (instead of water) without seriously endangering the ship. The framework of the envelope consisted principally of aluminum rings. The seventeen sections were so well made that the hydrogen pumped into them kept its standard filling-power for weeks on end, whereas in previous envelopes it had shrunk or escaped very quickly.



ZEPPELIN HYDROGEN CONTAINERS

The Count adopted a clever method of filling his big airship—or rather the balloons of the envelope—with hydrogen. Imagine several pontoon loads of iron bottles, with screw stoppers. These bottles were filled with hydrogen, and the screw stoppers attached to a filling-pipe. Then with a turn of the screw, the gas took its way into one of the seventeen balloons. About five hours were needed for filling the whole of the seventeen, which was a much less time than was required to fill the older and smaller single envelope balloons and early airships.

Powerful engines were given to the monster, and these drove four propellers, placed in pairs, nearer to the centre of the ship than at the ends, with about 100 feet dividing each pair. There were two cars slung underneath the envelope, and each had engines developing 16 horsepower. One very great improvement was made—the propellers could be reversed, so that the airship could run equally well backwards or forwards, and use was made of the sliding-weight arrangement which Santos Dumont had adopted.

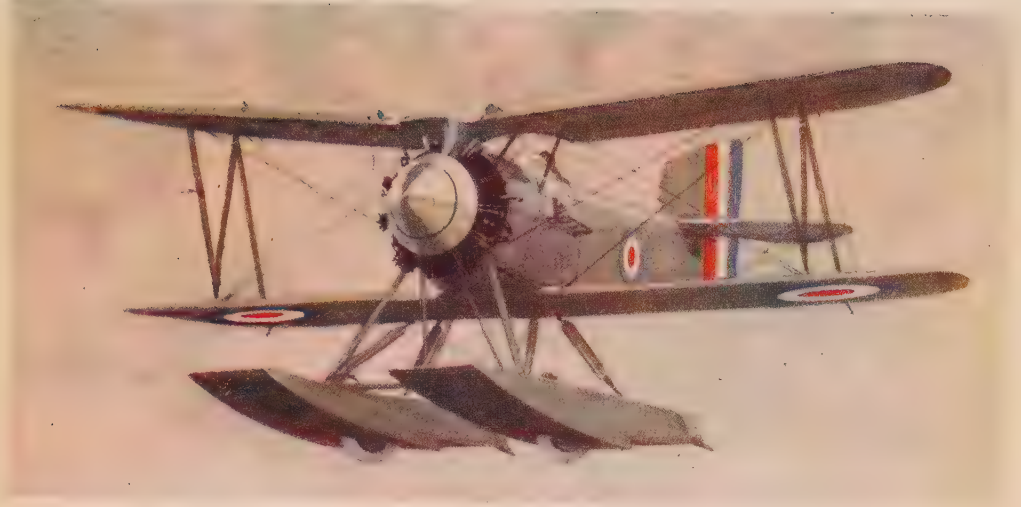
This airship, however, was really only an experiment, and we have no record of her cruising.

Of No. 2 and No. 3 of the Zeppelin family there is little to record, for, like their elder sister, they were purely experimental. It was a big task that the German nobleman had attempted, and he proceeded slowly. One of the greatest improvements was the fixing of a long keel, just under the envelope, along which the crew could travel from one gondola to the other.

Great hopes were built on No. 4 which made a trial trip of 230 miles to some of the Swiss towns in the neighbourhood of Lake Geneva. The German Government decided to secure her as the beginning of an airship fleet. Before taking her over, however, the military authorities asked that she should undertake a longer trip, and, if possible, make for Mainz on the Rhine. This she did with ease, and then started to return.

Her commander found it necessary to descend near Stuttgart, and tie up for a time. Unfortunately the barometer fell, and a storm blew up with great fury. The poor No. 4 would have been sadly handicapped in such a gale even had she been aloft, and on the





The Flycatcher



Rigid Airship R 36



ground she was like a ship anchored in mid-channel. She broke from her moorings, fortunately without any of her crew aboard, and shot up into the air. There followed a sharp report, vivid flames—and the Z 4 was no more! Some say that she was struck by lightning, which would have caused the dangerous hydrogen to explode; others declare that a spark from the electric batteries set fire to the petrol vapor. It matters little—in either case the work of years was destroyed in a moment, and the real danger of the airship was fully seen. This was in 1908.

The Germans came to the aid of their countryman, and raised a fund to build other ships of the same type—so great was their faith in the Zeppelins.

Soon after the disaster already recorded, a new Zeppelin was built as a passenger ship. She made several successful trips, with as many as a dozen passengers, but at length came to grief. During a gale she experienced propeller trouble, and was swept about in a dangerous manner, until finally wrecked in a wood. By great good fortune her crew and passengers escaped unhurt.

This did not deter Germany and her airship builders, but more and more the possibilities of this kind of aircraft for war purposes, rather than for peaceful voyaging, were considered. The Germans knew a great deal more than they were believed to know about the Zeppelins. They were quite aware of their weak points, and they purposely allowed those weak points to be known to the rest of Europe. France was so convinced of the practical uselessness of the airship for war purposes that she abandoned the building of them, whilst Zeppelin and his clever workmen went on steadily.

As eyes for the fleet and army, the German airships were very useful, but in raids on enemy cities their successes were few and their defeats many. They made too large a target both for guns and for the wily little aeroplanes, which played around them like David against Goliath. The greatest disaster they had was in October 1917, when a fleet of seven raided England, not one of which is said to have returned to its base. Most of them were shot down in France, having lost the greater part of their gas supplies.



But at least two marvellous voyages were accomplished during the war by the Zeppelins. One flew to Salonika, where it was brought down in flames, and the other actually voyaged out to German East Africa and got back safely—surely a fine flight!

The fate of the Zeppelins during the war, however, did not stop England from building two fine ships of this type. One of these, the R-34, was destined to blaze new paths in aerial navigation. In July, 1919, less than eight months after the war, the R-34 sailed over to the United States with a personnel of about forty officers and crew. That was the first time the Atlantic had been spanned by a lighter-than-air craft. But further honors awaited the British airship. She remained at anchor on Long Island for a few days then flew home again, completing a transoceanic round-trip, an aeronautical feat that stood without equal until nine years later when the Graf Zeppelin came over to pay us a short visit and then returned to Friedrichshafen, Germany.

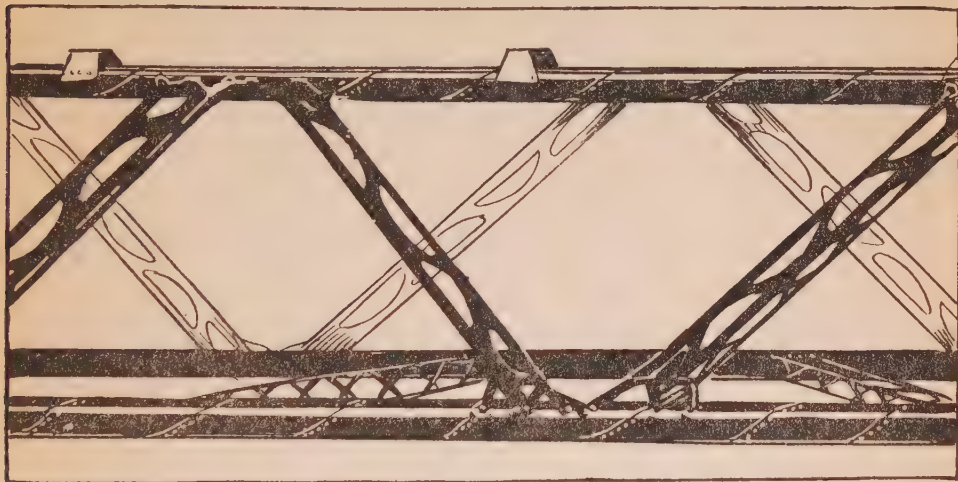
The English used both the R-34 and her sister ship, R-33, to gather data and gain experience for the construction of two super-airliners, the R-100 and R-101, designed and built under the watchful eye of Captain Burney. You will get some idea of the vast size of these ships when you recall that the R-34 contained 2,000,000 cubic feet of gas and the Burney craft will need 5,000,000 cubic feet of gas to embark on the distant voyages planned for them.

When England began to build her first Zeppelins the United States followed suit and constructed an airship which was afterward christened the Shenandoah. But America's first Zeppelin was doomed to tragic destruction. While flying over Ohio in a storm, the Shenandoah's frame broke. Some of the officers and crew were saved, however, by landing large sections of the ship after the fashion in which balloons are brought to earth.

The other Zeppelin belonging to the United States was not built here but in Germany, at Friedrichshafen. It was flown to the United States as the ZR-3. When the United States Navy took her over they named her the Los Angeles. The story of how we happened to get the Los Angeles is one of the strangest in modern aeronautics. It all came about because the late Major William N.

Hensley, Jr., of the U. S. Army Air Corps could not get fresh milk for his tiny baby while in Germany. Once when Major Hensley told this story he ended by saying:

"Whenever I see the 'Los' coming along in the sky I half-close my eyes and look at her real hard. Then she doesn't look to me like one of the finest aircraft any man has ever built but more like a gigantic milk bottle."



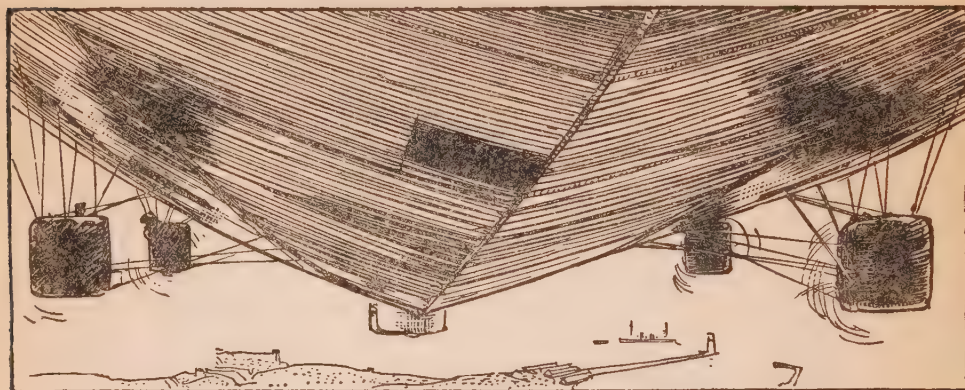
SECTION OF AIRSHIP GIRDER

This is how it happened.

Shortly after the war, Major Hensley went to Europe and took Mrs. Hensley and the baby, William N., 3rd, with him. When they reached Berlin there was a milk shortage. That annoyed the American army officer. He wanted his child to have the best food and nourishment money could buy. But he could not leave Berlin at that time on account of official business he had there. He thought things over and had an idea.

"Switzerland is famous all over the world for its milk," he said to Mrs. Hensley. "Everybody knows about the rich, creamy milk they use to make chocolate in Switzerland. You take the baby and go over there. It isn't far, and I can visit you for the weekends. I'll fly over."

The mother followed this advice and found good milk for the baby and plenty of it. The first time the major went to visit his family he travelled—as he had promised—by air. He covered part of the distance in a Zeppelin passenger ship then in operation. Major Hensley became interested in the craft.



UNDERVIEW OF "SHENANDOAH"

It should be pointed out here that the major already knew quite a lot about Zeppelins. When the R-34 flew back to England after crossing the Atlantic to America, Major Hensley was aboard her as the U. S. Army representative. So, when he looked over the Zeppelin in Germany he decided to visit the factory at Friedrichshafen.

It was a thrilling day for him and he marvelled at the tremendous possibilities of the rigid airship. So interested in the plant was he that it was not for some time that he noticed how gloomy the workers looked.

"A magnificent place," he told his guide, "but why do your men look so blue? What is it?"

"Herr Major," the German replied, "you would be downcast too if you were in their shoes. The terms of peace make it necessary for us to close down the plant. All these men will soon be out of work. We cannot build any more Zeppelins."



Major Hensley was silent. He thought hard, then he suddenly turned to his guide and seized his hand. "Maybe, we, over in America can do something," he said. "You can count on me to try."

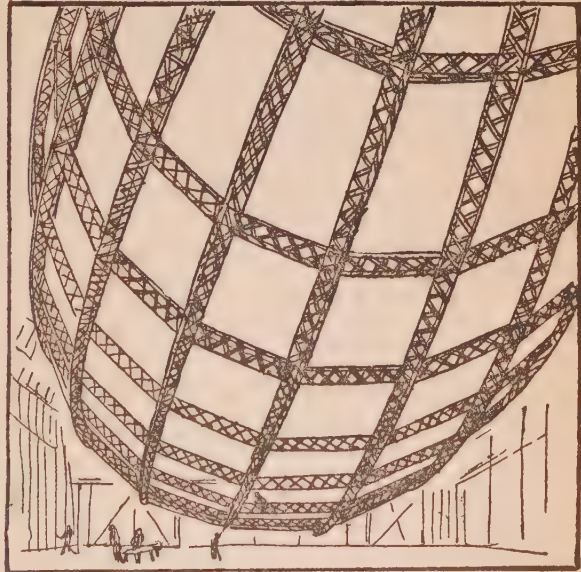
When he got back to Berlin he sent a letter to a friend in Washington who was very close to the President. He put his case this way: "The United States got absolutely nothing out of war. Why not ask for a Zeppelin?"

In a few months the Zeppelin works were going full blast and the workmen went happily about their tasks. But none of them knew, and few of them know to this day, that an American baby's milk bottle had caused it all.

And now, let us look into some of the interesting features of Zeppelin building.

There are 20,000 separate parts in a modern airship, and these are made up of two million pieces! As each of these parts requires a corresponding drawing, the drafting office is busy months ahead of the actual start in building the monster.

Work begins with what we may call the hull of the ship—that is the envelope container. The long cigar-looking envelope is not simply one huge bladder pumped up with gas—remember the seventeen balloons which the pioneer Zeppelin contained in the hull? First the frame of the hull is built, usually of light steel girders, the lengthwise girders being bound, here and there, by encircling rings of the same metal. If the girders could be placed on end they would stretch for over twenty miles.



FRAMING OF AIRSHIP R100

Still further to impress us with the quantity of material used in a single airship, we learn that of the binding wire for holding the portions of the framework in position there is well over fifty miles; and a six-acre field would be covered quite easily by the enclosing fabric! Gold beaters' skin is often used for inner balloons of the airship. The skin is mounted upon special three-ply fabric by means of a solution, and it has to be done with the greatest care—the lives of men depend upon the exactitude with which the skin is fixed upon the cotton fabric. These balloons weigh about 800 pounds and they undergo severe tests before they are allowed to be placed in position inside the hull.

It is essential that the framework, and as many parts as possible of the airship, should be manufactured from the lightest metal obtainable. This is a compound of aluminum, possessing great strength, and yet of a nature which can be easily worked. Thus it can be stamped out in strips, and, by a special process in which a chemical bath, heated to a certain temperature, is utilised, the metal is bent to any required shape. That is only one of the ways in which chemists assist in the aircraft industry.

Then comes the riveting of the parts. A neat little machine punches the holes with great exactitude, and another machine rivets up the parts with truly surprising speed.

The work of building the hull goes on rapidly. Instead of the men having to climb round the girders, the latter are rotated so that the riveting can be done on the ground. Then on the keel of the ship is the cat-walk—a long narrow path extending the whole distance of the ship. On each side we find various tanks, for fuel and water, arranged in such a way that they can be tipped clear of the ship should it be necessary. The water-bags, which are carried for ballast, can be tipped in the same way.



LILIENTHAL'S GLIDER

## CHAPTER VI GLIDERS

**Y**OU would think that the fun men had drifting around in balloons and, later, in airships, which they could steer, should have been sport enough for them. But it wasn't. They still wanted wings.

But this much they had learned: wings that flap were out of the question. Final proof of this came from Otto and Gustav Lilienthal, two brothers, who lived in Germany. Again we have brothers working together for the science of flying!

These brothers built their first wings while they were still boys in school. They made the mistake that so many men—and boys, too—had made hundreds of years before. They thought the wings should be made to flap. Otto put on a pair of flapping wings and had himself pulled off the ground by a rope tied overhead. An admiring crowd stood around and watched him begin to flap.

Otto worked hard. His eyes stood out and he breathed rapidly. His efforts were so funny that the crowd began to laugh. You know how much harder that made it for him to go on, but he did go on till he was exhausted. Then he gave up and they let him down, hang-



ing at the end of the rope as limp as an empty sack. With all that work, Otto had managed to "fly" just twelve inches. That ended flapping wings for Otto.

Then he turned to books on aviation. He was especially interested in what had been written by Sir George Cayley, an Englishman who was called by his countrymen the "father of British aeronautics." He had built a number of model gliders and one that actually lifted a man and carried him a short distance.

The Englishman was not so much interested in actual flying, however, as he was in studying its problems, writing about them and thinking things out. Lilienthal was just the opposite. The German made more than 2,000 glider flights before he crashed from fifty feet in the air and was killed. Tragedy has a strange way of stalking in upon important moments. And in Lilienthal's case death came in the glider flight which he had declared would be his last.

"In my hundreds and hundreds of flights," he told friends just before he adjusted his wings for the fatal one, "I have found out how to fly. I have built an airplane with an engine in it. I will fly it soon and I will never glide again."

In 1895, the year before Lilienthal was killed, the German's success with gliders attracted the attention of Harry Pilcher in England. He built a glider and called it the "Bat." It carried him on many short flights and, encouraged, he built the "Beetle," then the "Gull." A fourth glider, and his last, he called the "Hawk." He died from injuries he received while demonstrating this in bad weather.

Pilcher and Lilienthal left many writings and notes on their progress in gliding and these proved of great value to the future of flying. But this was not the case of the French sailor named Le Bris, who made glider flights even before the Englishman and the German. He patterned his glider after an albatross, a large sea-bird, he had caught while cruising in tropical waters.

He hired a man with a horse and cart, and tied on his glider.

"Drive down the sloping road at a fair trot," he instructed the man. "Look back, and if you see me rise off the ground, make your horse gallop."

They started off at a merry clip. The glider rose, and the driver of the cart seeing it off the ground, lashed his horse. But we don't think there was much need of the whip. The great bird-like contraption rising in the air must have given that poor horse more reason to run than any whip would have. With this added speed the glider rose higher and soared ahead of the frightened animal. Then the driver's troubles began. He got caught in the tow rope, which quickly snapped, and was carried aloft.

Le Bris kept his glider in the air over a distance of about 200 yards, soaring to an altitude of 300 feet with the scared countryman dangling below. Neither was hurt when they landed but the cart-driver quickly disappeared. We don't even know his name. He was too happy to get back to his plow furrows even to wait for the honor of going down in history as the first passenger in a glider.

While the Frenchman, the German and the Englishman were busy with their gliding the Americans were not idle. Out on the Pacific Coast and also among the sand dunes that border Lake Michigan, two Americans were making glider hops that had the neighborhood Old Timers shaking their heads and asking, "What are we coming to?"

The man in California was Professor J. J. Montgomery. He made hundreds of flights and, always, he was after three important things in flying. First, he hoped to find a way to make a glider keep its balance; second, he labored with great care to improve himself at the controls; and third, he sought the way to make his gliders climb, or soar in flight. Professor Montgomery's experiments began in 1884 and ended in 1911 when he was so badly hurt in a crash that he died.

The other great American gliding pioneer was Octave Chanute. He took up the art the same year Harry Pilcher did in England and like Pilcher, he studied what Lilienthal had done. But he went much farther than the German and the gliders he built were far ahead of anything that the world had yet seen.

In fact, Chanute's gliders were so well balanced, and therefore so safe to fly, that the builder let his friends try their skill in short glides when the weather was favorable. Chanute's success was due

in large part to his study of air currents. He made notes of everything he did and studied them after his flights.

Another man, whose writings on aviation were of great importance to America's interest in flying, was James Means of Boston. As any one who has been to Boston will tell you, Boston Harbor abounds with gulls. These beautiful birds attracted the attention of Means and he would sit by the hour to study them in flight. But he believed that the helicopter would some day solve the problem of man's conquest of the air. He published some interesting notes on flying and even had a bill brought before Congress calling for a reward of \$100,000 to any one who would build an "apparatus" that would fly with five tons of freight. This was the first United States air appropriation bill. A second bill also provided a \$25,000 prize to any one who would glide for a distance of one mile "toward any desired point of the compass."

These bills did not pass, but Means' work was not in vain. His writings, published in 1895, 1896 and 1897, were eagerly read by two young men in Ohio. These young men, brothers—surely you have guessed their names—were soon to startle the world. Means' share in this was admitted by Orville Wright some time later when, referring to Means' writings, he said that it was these writings that "were largely responsible for the active interest which led us to begin experiments in aeronautics."

But the Wright brothers' interest in flying goes back farther than that. In 1878, when Orville and Wilbur were boys, their father, Bishop Wright, bought them a toy helicopter. It was no complicated affair; just a tin propeller on a twisted rod. But it flew. It fascinated the youngsters. But helicopter is a difficult name for boys to use so Orville and Wilbur called it "the bat."

They were soon hard at work building home-made "bats." They made a number of them and they made them bigger and bigger until they were too large to fly. Then they went back to an earlier love, kite-flying. They had had much experience with kites and were better at it than many boys much older than they. They continued to experiment with kites until, as Orville once said, "we had to give up this fascinating sport as unbecoming to boys of our ages."



Later, when Orville and Wilbur were grown men and had their bicycle shop in Dayton, they decided to become active in aeronautics. They first considered experiments with gliders. They moved with care, however, and with a thoroughness that was to mark each and every step they advanced in the science of aviation. One of their first problems was to find a suitable place in the United States for their tests. So they sent a letter to the Weather Bureau in Washington to this effect:

"We want to make some glider tests and will appreciate your help in telling us where in the United States we will find the best conditions for this work."

Washington wrote back and told them to go to Kitty Hawk, North Carolina. Steady breezes are blowing almost all the time at Kitty Hawk, it is sandy country around there, and there is the Kill Devil Hill to be used for a starting elevation. That was in 1900. The brothers shipped the parts of their glider there to be assembled at Kitty Hawk and Wilbur went ahead to find out the lay of the land.

They had prepared themselves the year before by reading much of the literature on human flight, studying bird flight and devising a system of warping wings. They also decided that their problem was stability.

They began their experiments among the sandy wastes of North Carolina, first flying their glider like a kite. Then they made glider hops down Kill Devil Hill. This was in the autumn and when cold weather began to set in they returned to Dayton.

The following autumn they went to Kitty Hawk again with a new glider. Fishermen living along the shores in the vicinity and members of the Coast Guard Station remembered those silent, strange young men who were "actually trying to fly or something." But they welcomed them again to their midst. Visitors were rare at Kitty Hawk and even though the brothers did keep pretty much to themselves and never had time to waste words, it was good for them occasionally to see some one who had been over in the country in touch with things.

The Wright brothers were not satisfied with the results of their second year at Kitty Hawk, however, and they returned to Dayton

doubting whether they would resume their experiments in 1902. Referring to their second year's work, Wilbur once said that they "considered their experiments a failure."

But they did go back. The lure was too strong. They resumed their gliding with a machine on which they used a rudder for the first time. It was connected to the warping wires. After their third season with gliders, the brothers held the opinion that they had made sufficient headway to begin now with a powered plane. On March 23, 1903, their patent application was accepted at the United States Patent Office. Their glider days were over. Just a few months later they were to deliver to mankind the key to a door of science that had remained impassable for more than thirty-two hundred years.

But before we see exactly what happened on December 17, 1903, let us glance back at the brilliant and painstaking work of another American air pioneer—Professor Samuel Pierpont Langley.

Of all the men, in America or Europe, who tussled with the problems of aviation at the close of the 19th Century, Professor Langley did the most. He worked on power-driven, flying models and accomplished results that stood high above those of other aeronautical experimenters.

Langley had accomplished much for science before he took up flying. He was secretary of the Smithsonian Institution in Washington. He was a man already advanced in years. The death of Professor Langley is one of the saddest losses in the history of flying. He did not die in a crash—perhaps he would have preferred that—but he died, almost literally, of a broken heart.

In Langley's day it was the popular thing to ridicule and scoff at aviation experimenters. But Professor Langley, like all true men of science, was above stupid jibes. What hurt him though, and it hurt him to the quick, was the indifference his success received from men who should have known better.

The models built by this gentleman of science often met with unhappy fates. But, always, he rose to begin all over, his ardor undiminished, and his vision as clear as ever. He built models with steam engines that actually flew. He called his ships "aerodromes."

One of these, built in 1896, attracted the attention of the War Department and President McKinley. They urged the professor to build a full-size ship along the lines of his model and finally he agreed to do so. But he found that the steam engine was too heavy so he began to study the possibility of using the gas engine. He engaged to help him a man named Charles M. Manly. They worked together for five years, from 1898 to 1903, Manly's chief attention being given to the engine while Langley worked out the best design for the ship.

The test was made over the Potomac River at Widewater, Virginia, on the 17th of October, 1903—just two months to the day before the Wright brothers made their first flight at Kitty Hawk. The machine failed to take off, as we say now, because a guy post caught, causing it to plunge into the river.

Another attempt to launch Langley's "aerodrome" was made on December 8th. Again a guy post seemed to drag and the rudder came down on the launching ways. The machine crashed. Then the War Department decided that it could not give any more money for rebuilding the ship and Langley abandoned the project. And thus, the most promising airplane that had ever been built was ignored. It lay neglected for eleven years, then Glenn H. Curtiss rebuilt it with some slight modifications. He took it to Hammondsport, New York, and, using the original engine Langley had installed, he flew the "aerodrome" successfully. But Langley, its builder, did not reap the reward the world of aviation owed his genius. He was dead.

When powered-planes became a proven success, men gave little further thought to gliding until after the World War. Then the Germans took up this branch of aeronautics. They had a good reason. The peace terms forbade the Germans to build any other sort of aircraft. So the Germans made the most of what was left to them and because airplane, or glider, materials were so rare and so costly, they built gliders with all sorts of material that would have been thought before that totally useless. They used bean poles, shipping crates, and even tin cans to build their gliders. And what is more remarkable, they actually flew them.



Tests of these contraptions, as you may well imagine, attracted wide interest. Every Sunday and holiday, crowds poured out of Berlin and other large cities in Germany to nearby hills to watch the devoted airmen risk their necks. A considerable number were killed, many were totally disabled and others received minor injuries.

It seems that man does his best when the odds against him are greatest. In any case, the Germans developed gliding to an undreamed-of perfection. Today there are hundreds of young German men who can fly motorless planes, for gliding has become a sport in Germany. And so it is also over here in America.

The moment our friends across the Atlantic began to accomplish so much with motorless craft, certain American aviation fans brought some of the best glider pilots over here to teach us how it was done.

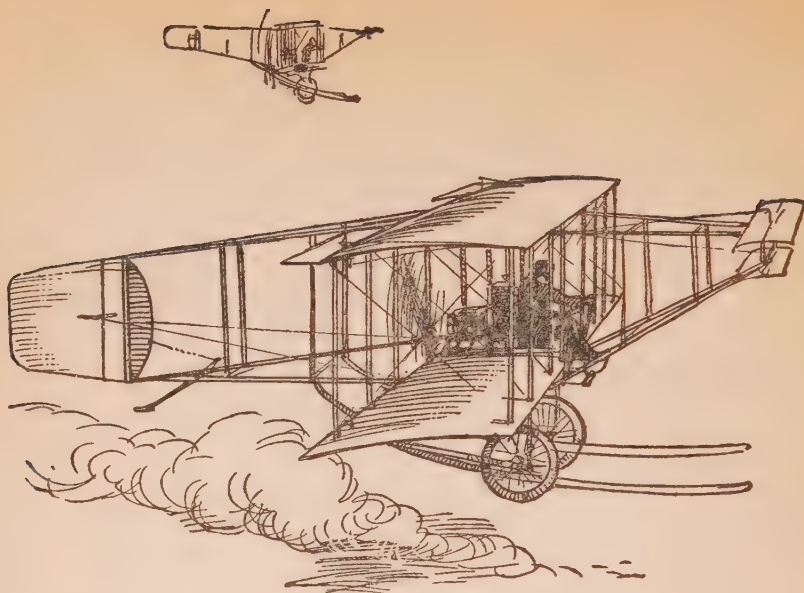
Among these was Peter Hasselbach. He and his colleagues spent the summer of 1928 on Cape Cod, near Provincetown, teaching Americans the art of gliding. Hasselbach's best record at Cape Cod was something over four hours in the air. Now we have glider clubs at some of the colleges and also a National Glider Association. There has been no attempt to make gliding pay here as a business. Perhaps that day is ahead of us, but for the time being, gliding is purely a sport.

Glider contests are planned for the future and the National Aeronautic Association has approved of rules governing such competitions. There are three classes of glider licenses here as in Germany: A, B, and C. Requirements for the first are simple, merely a straight glide of a given duration. Class B gliders qualify by making a turn in the air and Class C by turning and soaring, or climbing without an engine. Many aviation experts believe that all airplane pilots should be required to take glider tests for all three classes before receiving aviation licenses. An expert glider, they contend, and rather rightly you will agree, would stand less chance of cracking up when his motor failed than a man without experience in gliding.

An unusual feature of gliding is the fact that bad weather, which has forever been a "bugaboo" to pilots, actually helps motorless

flight. Dr. Wolfgang Klemperer, one of the most famous German gliding experts, has stated that the stormier the weather the greater are the chances of the glider to reach high altitude. But the rule works the other way, too. A dead calm will keep a glider pilot on the ground. He must have at least a breeze to get into the air.





## CHAPTER VII

### THE FIRST FLIGHT

**W**HEN the Wright brothers went back to Kitty Hawk again in 1903 they were at the door-step of aviation. But their arrival caused no stir in the section. The villagers in the little towns around Currituck Sound finally heard in their general store gossip that "the young fellows from Dayton are back at Kitty Hawk again."

While the natives of the section talked about the possible outcome of the Wright brothers' "flying-machine" those serious aeronauts kept strictly to their work. They never had time to argue with the people that doubted them. When they went to the country stores they made their purchases and left at once. They worked morning, noon and night, keeping to themselves, wrapped up in the task of building the world's first successful airplane.





THE MACHINE FLEW EASILY AND SAFELY

Finally the day came when Orville and Wilbur were ready to test their machine—December 17, 1903. It was a chilly winter's day. The winds that forever whip across the sandy stretches at Kitty Hawk whistled through the scattered, scrubby bushes north of Kill Devil Hill at the rate of twenty-seven miles an hour.

For years after this first flight, there were many aeronauts who never dared to attempt a take-off in a twenty-seven-mile-an-hour wind but the Wright brothers were not dismayed. They had studied the winds at Kitty Hawk for three years and had made glider flights in much higher velocities. So, at ten o'clock that great morning they dragged their plane over to the sandy expanse north of Kill Devil Hill and set it up on a greased monorail they had prepared for it—the first runway.

All the people who had heard about the "flying machine" were invited to come and see it fly. How many do you think came? A thousand? A hundred? No. Five! Five men saw the Wright brothers make the world's first successful airplane flight!

Of course, Kitty Hawk was a hard place to reach from the mainland and we can understand that an hour's boat trip across the wind-chopped sound was not exactly inviting. But that is the more credit to the two men from Dayton who braved that forlorn shore for so many months to solve the problem of man's flight.

The five who were the brothers' guests inspected the plane eagerly. But, perhaps, they were not greatly impressed. It was not very much different from the glider the Wrights had used the year before.

This one was stronger, however. They were able to make it stronger because their engine developed more horsepower than they had expected from it. The Wright brothers got their idea from a motorcycle engine and built it themselves.

It developed thirty horsepower and weighed only about two hundred and ten pounds—just seven pounds per horsepower. Even if the plane had not flown, that engine would have made the Wright brothers famous.

Without the tiny power plant, the plane weighed somewhere around one hundred and twenty pounds. It was a biplane with a

wing span of thirty-two feet and a chord of about five feet. The pilot lay horizontally across the middle of the lower wing.

When everything was ready, the brothers tossed a coin to see who would make the first flight. Orville, the younger brother, won.

He climbed in place and grasped the controls—far different from what they are now—and signalled that he was ready. The Wright brothers knew enough about gliding to lay out the monorail track so that it headed directly into the wind, a practice that is observed to this day.

The plane started along its track at a slow pace, the propeller revolving so lazily that the eye could follow its turns. Breathlessly Wilbur and the five guests watched as the little ship picked up speed and scurried along. Twenty feet and it still rode the monorail. Thirty feet, forty feet and it rose into the air.

Gradually it climbed to the height of a man's waist; then shoulder-high, then higher than a man's head and on to eight or ten feet. The sky along the flat horizon separated the airplane from the earth. Man's first controlled, power-driven airplane flight!

It all happened in twelve seconds. The distance was measured and it was found that the first flight covered one hundred and twenty feet. It was made at 10.30 o'clock in the morning. Before noon there were three more flights, two by Wilbur and one more by Orville.

Flight number two was made by Wilbur. He was in the air thirteen seconds and covered a distance of one hundred and ninety-five feet. Then came Orville's turn again and he flew two hundred feet in fifteen seconds. In the fourth flight Wilbur broke all records and stayed in the air for fifty-nine seconds and covered a distance of eight hundred and fifty-two feet.

In none of these little hops did the Wright brothers make any attempt at altitude. They had talked things over and decided that they would merely see whether or not their ship would fly. The four flights left no doubt in their minds so they broke up their camp, packed their belongings and left Kitty Hawk not to return for almost five years.



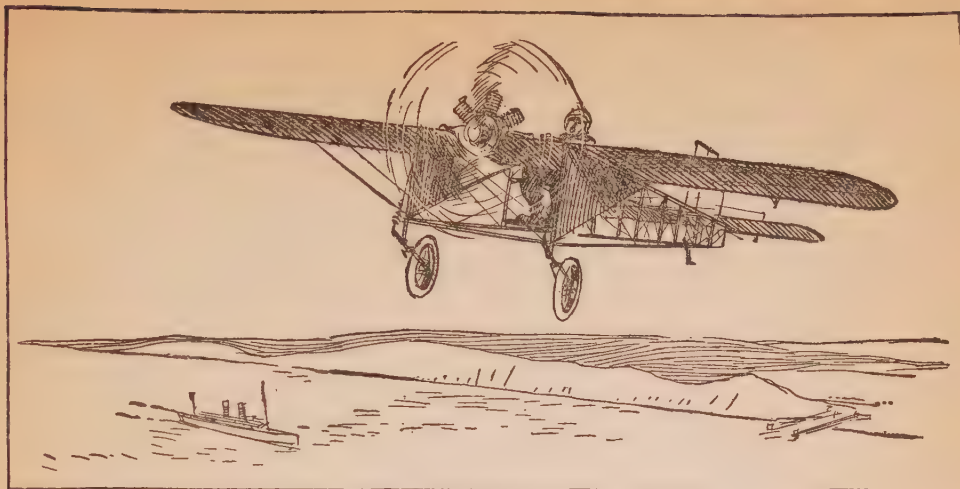
But Orville, the one surviving brother of that famous pair, was again in Kitty Hawk in 1928. And how different it all was. The country itself was not much changed but the occasion of welcoming back the first airplane flier was a great affair. It was the twenty-fifth anniversary of that first flight.

High government officials from Washington, famous fliers from all over the world, and thousands of people in that district were gathered to render homage to the name of the Wright brothers.

A giant stone marker was unveiled where the Wrights began their glider experiments and the corner stone was laid for a monument on Kill Devil Hill. The great men from the nation's capital delivered speeches during these ceremonies, praising the Wrights for giving to America one of the most powerful instruments of peace or war in our modern times—the airplane.

Many Old Timers came forward timidly and asked Orville Wright if he remembered them. One of these held tightly in his hand a polished stick of wood.

"I have saved this because I knew this day was sure to come," he said. "It is one of the most treasured things I own, but I want Mr. Wright to have it. It is a piece of a strut from his first airplane."



BLÉRIOT CROSSING THE CHANNEL

## CHAPTER VIII

### EARLY AIRPLANES

**W**HEN the Wright brothers got back home in Dayton they set to work in real earnest to build another plane. They were modest about their flights; they were not the kind of men to brag about what they had done. In fact, they said so little that the first airplane flights did not attract anywhere near the attention we should think they deserved. But the time was not far off when the Wrights were to be called to many parts of the world to fly their machines.

The machine they built the year after leaving Kitty Hawk was heavier and stronger than the first power-driven plane. They took it out to a level stretch of country eight miles from Dayton and resumed their flight experiments. During 1904 the brothers made one hundred and five hops, covering a total distance of about twenty miles. They put their main efforts into making the ship as stable as possible.

Curiously, these flights and some of those the following year attracted little public attention. In 1905 flights were being made

for several miles and toward the latter part of the year the Wright brothers were making a speed of thirty-eight miles an hour. They lengthened their hops from the humble beginning of one hundred and twenty feet, two years before, to twenty miles in October, 1905.

Then people began to take an interest in the "Wrights' flying-machine." They flocked out to the field where the brothers were working and waited around to watch and to ask questions. But the Wrights wanted to work and experiment quietly and alone without the annoying stares and questions of the idly curious. And there was the further danger that someone might attempt to copy their planes.

The brothers were eager to make a flight of an hour's duration. But the curiosity their experiments had aroused made it necessary for them to abandon further flying without doing this in order to protect their ship designs and construction secrets from public prying.

In the meantime news of the successful airplane flights by the two American brothers had reached Europe.

France, the European pioneer of air travel, invited the Wrights to bring their planes across the Atlantic; they did so, and, at Le Mans, Wilbur proved to the world that his claims were rather underestimated than overstated.

The French proudly claim that Ader, an electrical engineer, anticipated the success of the Wrights by six years. He claimed to have built the first monoplane to make free flight. His machine was a large rectangular box, standing upright upon wheels. In it were the pilot and his engine. Four propellers were fitted in front of the box, and the wings were shaped as nearly as possible like those of a bat, which is perhaps the best flier among winged creatures.

The French Government was eager to get a flying-machine for military purposes, and they came gallantly to the aid of this clever inventor. Perhaps even then the French had a presentiment of what might be the deciding factor in future warfare. As in so many of the early flying-machines, steam was relied upon for motion, and, of course, steam was not equal to the task—or rather, the machine was not equal to the task of lifting the engine, its food and its drink.



This machine was known as the "Avion." The military authorities arranged for a thorough test of the "Avion," but the wind was strong, and against this the "Avion" did not even come up to the modest expectations which had been formed for it, and it was sent to a Paris Museum.

The imagination of Tatin, another Frenchman, was fired by these experiments, and he decided to build a model himself. This he did, and set it going over the sea. It went, and the sea claimed it, as it had so many of the early aircraft. It was lost, and with it went Tatin's enthusiasm, following what was quite a respectable fortune expended upon his experiments. Without Government aid it was impossible for the average man to attempt serious experiments.

Two other names deserving honourable mention in connection with the early airplanes are those of Archdeacon and Voisin. They produced many successful machines—successful that is for their day.

Voisin had a narrow escape upon one occasion. He was attempting a trial flight with a new airplane, choosing, in case he should drop, to make the trial over water rather than over land. He did drop, and, to the horror of the spectators, the machine turned turtle as it sank, imprisoning the plucky airman underneath. For some moments it was feared that another tragedy had been added to the already mounting list of lost airmen. Then the water swirled, and up came Voisin, hard pressed for breath, but lucky to have got free from such a death-trap.

When the airplane began to emerge from the experimental stage Santos Dumont, of whom we have read in an earlier chapter, was one of the first to tackle the new form of flying. But whereas his airships were graceful things, like air-yachts, his first airplane was rather ugly. It was made upon the box-kite principle, and the motive-power was a double-bladed propeller of aluminum, driven by a 50 horsepower motor.

There is a little story told of this ungraceful-looking airplane of Santos Dumont. France was still ahead in aviation, and the Aero Club had organised a meeting in which all inventors were asked to compete for a race of 25 metres, which is as near as possible 27 yards! This was in October 1906. Most of the entrants failed to get

off the ground at all; but Santos Dumont's machine did, and though it went but a short distance, so great was the excitement of those present that the judges forgot to measure the ground covered! Santos Dumont added the Archdeacon prize to his already rather heavy bag of prizes. Very soon afterwards he was able to claim a flight of over 200 yards, and then, as with the Wrights, but three years later, step by step, the yards became miles.

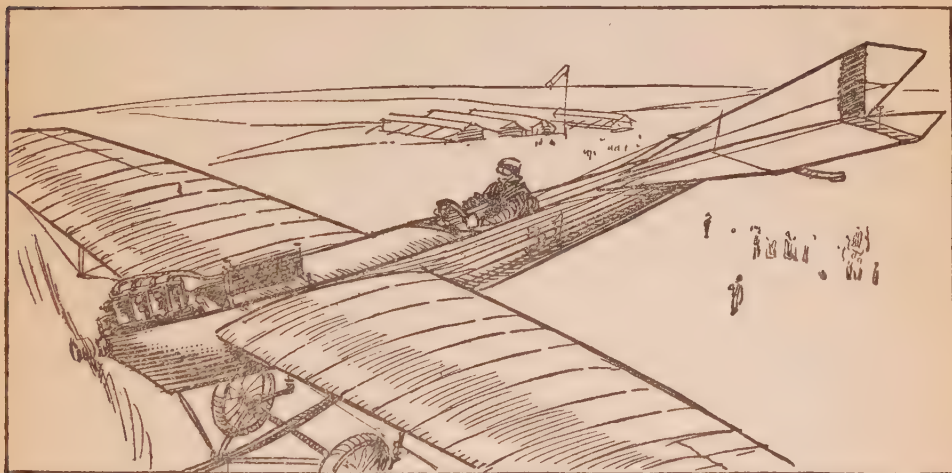
Then Farman came on the scene. He was a born pilot. He did not attempt to make a machine himself, but took his ideas to the Voisin Brothers, who had already made very definite progress with the airplane. When his machine was delivered to him, Farman did not take it out like an impatient boy, start it up, and come down in distress; instead he decided that he must train himself as pilot. First he studied the machine in every detail, then he tested it in every respect, then he began what he called rolling experiments—that is, the plane was run about on the flying-ground.

In September 1907 Farman managed a flight of roughly 100 yards. In the next year he managed 840 yards, and then he felt able to offer to fly the circular kilometre flight for which a valuable prize was offered. The distance seems small; but it was the fact that it was to be a circular trip which would prove the greatest difficulty. Farman had practiced this phase of airmanship very carefully before he announced himself as ready to try for the prize, and his patience was rewarded, for he won it.

This feat of Farman was soon eclipsed by that of another famous pilot of the early days—Delagrange, also a Frenchman. Here a circular flight of two miles was accomplished. After this, he succeeded in remaining in the air for flights ranging from fifteen to nineteen minutes, and this was a big step forward.

Wilbur Wright came to France and astonished those people who thought that the stories from across the water were all imaginary. He quickly carried off the Michelin prize, covering about 50 miles in an hour and a half, and was soon taking passengers up on his crazy-looking machine with its precarious seats (one looked at the country below whilst holding on for dear life, for in these machines there was nothing immediately between one and the ground).

Farman and others watched and learned from Wright. Farman essayed, and brought to a successful conclusion, the first long-distance cross-country flight—a far bigger achievement than just circling round a field. In the ordinary flights an aviator could reckon upon a fairly safe landing-place, but when the cross-country flight was attempted, it was something like the setting out of Columbus for America—there might be land or there might not—there might be a return, or more probably there might not. Far too many of these early aviators paid with their lives, leaving the world richer by their efforts, but poorer by their loss.



LATHAM'S "ANTOINETTE"

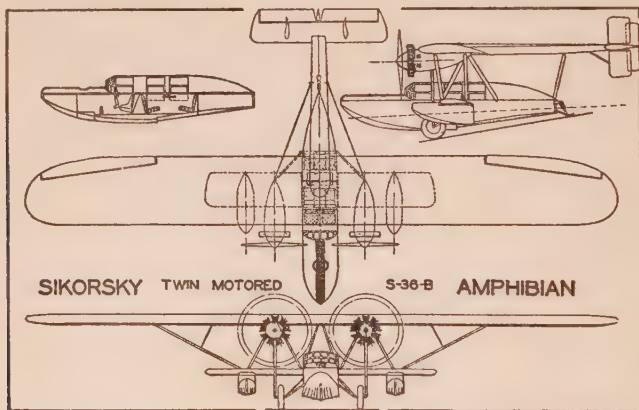
Yet another Frenchman now entered the air world—Blériot. What Farman had done Blériot felt that he could do, and he brought out a monoplane, with which he equalled the performance of his illustrious countryman.

Another Frenchman, whose name was to become very famous, was Hubert Latham, whose Antoinette airplane attracted a great deal of attention. The body of this machine was boat-shaped, with a bow similar to that of a rowing skiff; the wings tapered gracefully outwards; while the tail looked something like a dart. The machine was driven by a two-bladed propeller, right at the front. The frame-



work was of aluminum, covered by a glazed fabric. This airplane, though not so famous as many others of the first types, set the fashion in many ways, portions of the design being embodied in later machines.

Latham decided to fly the English Channel—then considered the real test of an airplane. In July of 1909 an English daily newspaper tried to assist in this achievement by offering a good prize for the first airman to cross the "silver streak." While the same distance had been covered over and over again, yet, somehow, the impression gained ground that flight over land was easier than over water, though really, of course, where safety counts, the reverse is the case.



Latham was the first to attempt the flight, and, with a tug in attendance, he left the French shore, and went skimming along beautifully.

Soon the tug was left behind, and it seemed that the attempt was to be quite successful. Alas! something went wrong with the engine, and, halfway across, Latham had to descend and float steadily on the sea until help came to him. Within a week, a second attempt at the Channel crossing was made, and this time was quite successful. Blériot was the pilot, and the spot where he landed at Dover is now marked by an airplane of stone. His monoplane was brought to London, and there exhibited to the admiring and wondering crowd.

Soon afterwards the first flying meeting of importance was held at Rheims, and the visitors beheld not one, but a dozen planes in full flight at one time, many of them attempting flying evolutions which seemed very wonderful.

That was in 1909. In the three years since Wilbur Wright had demonstrated his plane to the Europeans those people had made swift progress. Back in America things were moving rapidly, too. Aero clubs were springing up all over the country; medals were being awarded for outstanding achievements in air work; and a number of promising fliers soon to be reckoned with were in the field.

One of the foremost among the latter was Glenn H. Curtiss. He made his first hop May 22, 1908. Within two years Glenn Curtiss, J. C. "Bud" Mars and other fliers put on a five-day aviation show in Memphis, Tennessee. Later, as we have already pointed out, Curtiss was to fly the Langley plane with its original engine.

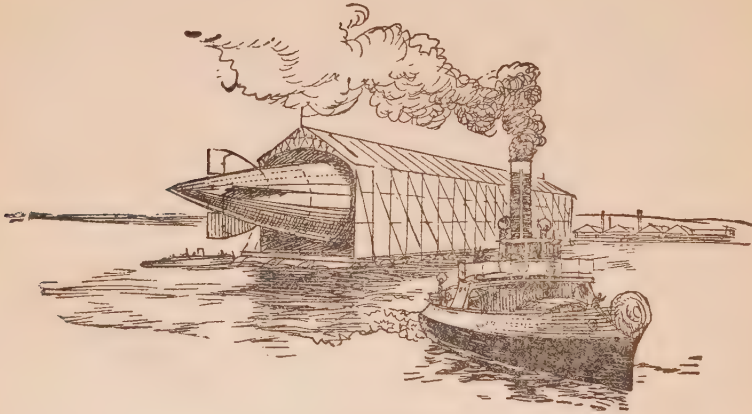
The third man in the United States to fly was Dr. William W. Christmass. He invented the aileron as used today. His first hop was March 8, 1908. F. W. Baldwin was the fourth man in the United States to fly an airplane. He took up the "Red Wing" of Dr. Bell's Aerial Experiment Association on March 12, 1908.

The "White Wing," built by this same organization, was flown a little over two months later by J. A. D. McCurdy; and he was the seventh in the United States to fly a plane.

As the popularity of flying spread over the country the Army became interested and Orville Wright demonstrated a ship for the military authorities, carrying as passenger Major General George O. Squier. Army officers must have realized that the airplane would some day mean a great deal in war because the following year Wilbur Wright was engaged to teach flying to Lieutenants Frank P. Lahm and Benjamin D. Foulois, now both brigadier generals.

The United States Army Signal Corps advertised for airplane bids on December 23, 1907, and in five weeks received twenty-two offers. That's how busy airplane men were here twenty-two years ago. But they are much busier today. During the year 1928 there were 148 different plane models built in the United States.

Contracts were awarded in the first army plane bids to the Wright brothers, A. M. Herring and James F. Scott. Three months later the Wrights were back in Kitty Hawk, making flights in preparation to filling orders for planes that poured in from all over the world.



FLOATING ZEPPELIN SHED





## CHAPTER IX

### WAR FLYING

**A**S EARLY as 1910, France got together their airplanes and tried them out with her army. The French were in earnest about building planes for war. Improvements came along rapidly and by the following year there were more pilots in France than in the rest of the world put together.

In America, where the airplane was invented, interest was far behind. In 1911 we had only about twenty-six certified fliers. We were last on the list. France, as we have said, was first, with 353 pilots. England was second, with fifty-seven; Germany, third with forty-six; and Italy, fourth, with thirty-two. Even little Belgium was ahead of the United States then with twenty-seven qualified fliers to our twenty-six.

The next year saw the beginning of war flying. The Balkan States, that group of little countries east of the Adriatic Sea, started a squabble among themselves. No one paid any great attention to them. Their tiny armies chased one another around among the rocky hills of a worn-out country as they had been doing for many years before. A few fliers went down there, however, just to see if planes could be used for war.

The results did not amount to much, largely because the planes at that time were still such crude and faulty affairs that they could not be depended on to take off and get back. But two years later these fliers were back in Western Europe for the greatest war of all times.

As soon as the warring nations sent their armies into the field they set about to build up their air forces. The planes on hand in Europe in the Autumn of 1914 were, in many ways, better than those tried out in the Balkan wars, but they were still far from satisfactory. There were none of those speedy little Spads that the French handled so well in the closing days of the war. The enormous Handley-Page bombers, equipped with two Rolls-Royce engines, were still months away. Sopwith-Dolphins that could climb 20,000 feet, and those famous—and by many, beloved—Camels were yet to come. So were the SE-5's, the British Blériot Experimental training ships which the pilots called simply B. E.'s—the Nieuports, the Fokker D-7's with which Germany caused the Allied fliers a lot of trouble, and Germany's giant Gotha bombers.

DH-4's were not yet built; the Liberty engine had not even been thought of, and, of course, the ugly, heavy JN-4's, or "Jennies," as the American pilots called their training planes, were years away. American fliers declared that the Jennies were the worst and at the same time the best ships for training.

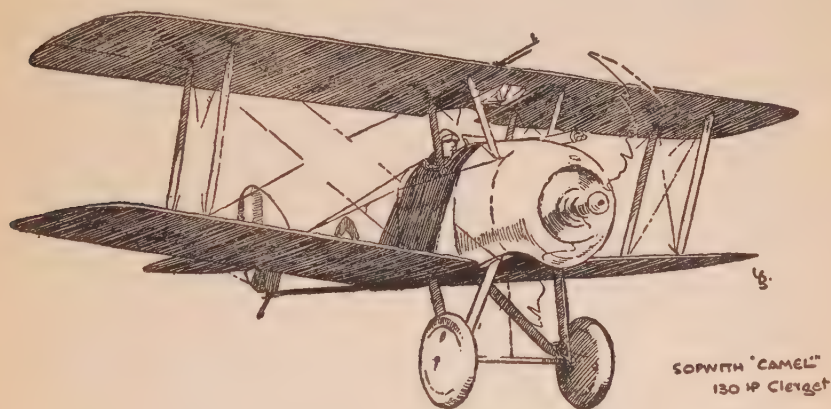
"After you have flown a Jenny," they said, "you can fly anything with flippers and a 'prop.'"

The first uses of the planes were for observation and patrol work. The ships were not armed in the beginning and it was reported that enemy pilots passing one another in the air, having nothing else to do, smilingly exchanged a wave of the hand. It was not long, however, before pilots were equipped with rifles or automatics. But this proved to be little more than a joke, because the pilot could not tend to the business of flying and try to handle a clumsy gun at the same time.

An experiment was made with the larger ships but it proved utterly useless. A man with a rifle was put on each of the lower wings with instructions to shoot down enemy aircraft. A few flights

under these conditions, however, soon convinced all concerned that aiming a gun while trying to hang on to an airplane strut in flight was altogether too large an order.

The first definite step toward a fighting plane is accredited to Roland Garros, a Frenchman, who had become famous as an aviator before the war. It was Garros, we are told, who found a way to send a stream of machine-gun bullets through his whirling propeller without injuring the "prop." It is interesting to note that the bullet left the muzzle of the gun when the "prop" was right in front of it. But by the time it had travelled to where the propeller was, the blade had turned out of its path.



Garros made quick work of the enemy planes he met after setting up this "synchronizer" of his. Five German ships fell under his attacks in eighteen days. Then, one day when he was on a bombing expedition—what the war fliers later came to know as "laying eggs"—his engine failed and he was forced to land behind the German lines. He hastily set his plane on fire so that the enemy would not discover his synchronizing invention, but the Germans came up in time to put out the flames and soon thereafter fighting scout planes were filling the skies from East and West.

Only the fastest ships were used in this combat flying. They were single-seaters that answered quickly to the pilots' use of the



controls and the aviators that manned them were fliers of great daring and skill. Their duties were to clear the sky of hostile aircraft, protect bombing expeditions, shoot down enemy observation balloons, report all troop movements, and often "strafe," or fire on, marching infantry columns.

Along with the development of the fighting scouts, other war planes had made considerable advances. Observation, which included aerial photography, bombing, directing artillery fire, and patrol flying, especially over important coastal points and sea bases—all these branches of air work as well as scouting, were calling thousands of young men into war aviation. Young men in America, long before the United States entered the conflict, were flocking to England and France to become fliers.

Many of these joined the regular air services of the Allies but one group formed the Lafayette Escadrille. This escadrille soon became known as one of the bravest aerial fighting units on any front. Their services were greatly prized by the Allies and they quickly commanded the respect of the enemy as skillful and fearless fighters.

Every nation in the world war had its air heroes and the names of some of these daring young men should not be forgotten by us. One of the bravest of these was Frank Luke, Jr., of Phoenix, Arizona, a dashing airman, whose delight in bringing down the fat German "sausage" balloons earned him the name of the "Balloon Buster." He was the only war pilot to whom the United States awarded its Medal of Honor. Frank was forced down behind the German lines and could have surrendered without harm to himself. But this he refused to do. Instead, he whipped out his automatic and emptied it at the enemy. They returned rifle-fire and Frank died beside his plane.

Captain Edward V. Rickenbacker is called the American Ace of Aces. "Eddie" was given official credit for twenty-five air victories but his actual score is much higher. Official credit was given only when three or more witnesses saw an enemy ship fall. George Vaughn has been called the United States' second ace and Raoul Lufbery was one of the most daring air combat men in the war.



Coming in  
(3-Engine Jupiter Imperial)





René Fonck and Georges Guynemer were France's greatest aviation heroes. There wasn't so much as a speck of fear in either of these great air fighters and when they went after the enemy it did not matter whether there was one plane in the air or a whole formation. Fonck was given official credit for seventy-five enemy machines and Guynemer for fifty-three.

Guynemer was a member of the famous Cigognes, the fliers who were in the air almost constantly during the fierce fight for Verdun. It was here, too, that the Americans in the Lafayette Escadrille won high honors. Many men who have studied that terrible battle at Verdun say the aviators saved the day.

Guynemer, during his spectacular career was shot down eight times and he often returned to his airdrome with the wings of his plane riddled by enemy machine-gun bullets and shrapnel. Fonck, on the other hand, was never even hit. His skill in handling a scout ship probably exceeded that of any other French flier. It was his custom to fly high—20,000 feet above the German lines—and pounce down on the enemy. One day in May, 1918, he shot down six planes in a single day. And he repeated this feat four months later.

Albert Ball was one of England's most daring air fighters and his victories over German scouts won for him many decorations, among them being the Victoria Cross. In September, 1916, Ball brought down a formation of three planes, two planes from another formation, and one from another—a total of six ships, which equalled Fonck's records.

Another flier to receive the Victoria Cross was William A. Bishop, the Canadian ace, credited with seventy-two victories. Bishop had a habit of flying over German airdromes to pick a fight, you might say. He got many of them and in most cases the enemy was sorry for it.

Two of Germany's greatest aviator-heroes were von Richthofen and Immelman. The former is said to have won more victories than any other one flyer in the war, with an unofficial total of well over one hundred. Like Fonck, von Richthofen flew high. He would follow a German formation across the lines and when a "dog fight" started he would hold his perch high up there until an oppor-

tune moment, then would swoop down with his two machine-guns ripping into an unwary plane of the Allies.

Immelmann is said to have discovered the quick turn of a plane that bears his name. To do the "Immelmann turn,"—fliers now call it simply the "Immelmann"—the pilot pulls his stick back so that the plane zooms up sharply and goes on over till it is flying upside down. Then he does a half-roll to right himself. Thus he is higher up and headed back the way he was coming when he started the turn.

Lieutenant Immelmann flew over Paris daily in the early part of the war and one day dropped a message in a sand bag telling the people in the French capital that they had better surrender because the Germans would soon be marching into the city. He also "laid eggs," as we have learned to call bombing, but the torpedos were small and did little damage.

There were many other notable fliers during the war, brave men who dared death with a snap of their fingers each time they left their airdromes. Day by day they saw their buddies, mortally wounded, go spinning down out of control, or plunge earthward with their planes in flames. No one knew when his turn was coming. A formation would be ordered out. Its return would be awaited with anxiety. Who would not come back? Whose turn was it today? An hour, two hours pass. Suddenly the drone of motors is in the sky.

"Here's that formation coming back," the word goes to the hangars and pilots' quarters. "Are they all there? Anybody missing?"

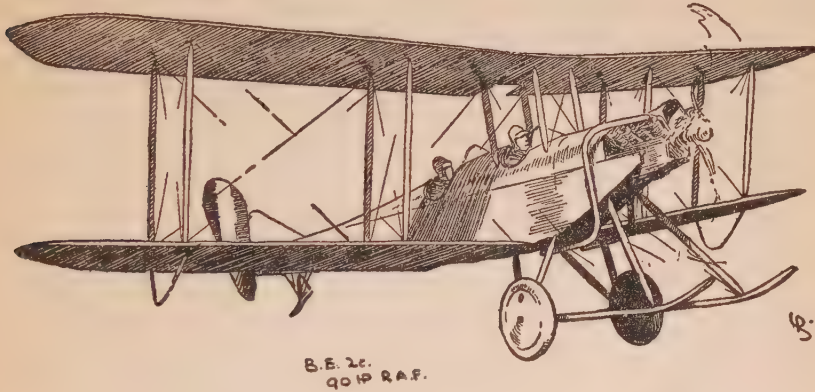
"Two are gone," says some one. The pilots watch in silence as the ships land. The lucky ones get out—to take off again tomorrow, or again today, maybe—some of them, perhaps, for the last time.

Is it any wonder that war aviation bred that fine comraderie among fliers—even enemy fliers? Aviators had respect for one another—friend or foe. It was a brotherly spirit and it was felt in all armies.

When Quentin Roosevelt was shot down, a German plane came over his airdrome the next day and dropped a note telling where he had been buried. Then his comrades went up in a formation and dropped flowers on the grave. Not a German plane left the ground

to interfere. Of course, the Allies did the same thing. It was a noble spirit on both sides, a high degree of chivalry.

This feeling of sympathy among aviators for the great dangers each must pass did not die out after the World War. In other smaller conflicts since then the fliers have lived up to a strict code of honor toward one another. The Mexican revolution showed us in April, 1929, that the aviators down there have a deep respect for the



enemy dead. When two Federal fliers were shot down behind the rebel lines, their bodies were returned to the federals under a flag of truce and the commander of the uprising forces sent his enemy this note:

"We send back the bodies of your brave dead in the same spirit that animated them. They died in what they considered a just cause."

Let us hope that this spirit of chivalry among fliers will live forever.

There was one war in Europe, one in Africa and a revolution in a Central American republic following the World War and many veterans of air fighting enlisted "just to see some action," as they expressed it.

The first of these was in the Balkan States where the airplane had seen its first service as a machine of war. The arrival of aviators



who had fought with the Lafayette Escadrille, the French, British and American air forces, was hailed by both sides as a sure road to victory. But in counting their chickens before they were hatched, the fighting countries forgot that all these pilots had been friends. Now they were divided. Some of them joining one side, others the other. It did not matter to them what these fellows were fighting about, they just wanted to see some excitement.

There was only a handful of fliers on each side but the embattled little countries were anxious for a "greater aerial engagement." Finally the day came when a plane loomed over the capital of one of the countries. "An air raid!" the people cried.

An American, a former Lafayette Escadrille pilot, was rushed out to the flying field and instructed to go up at once and fight off the enemy. The American had a Bristol, an English ship. He took off at once and started after the enemy plane, which was also a Bristol.

"Looks like an even fight, anyway," he said as he climbed toward the other ship. It was circling around, apparently waiting for him to get the same altitude.

"That's clean sportsmanship," the American thought. "I wonder, though, is he up to some trick? Can't tell about these fellows down here. I'll send a couple of tracer bullets under him just to see if he's awake."

The pilot of the other Bristol saw the bursts, all right, but instead of returning fire, he pointed the nose of his plane upward and deliberately fired away out of range.

"That fellow is mocking me," said the American. "I'll have a look and see who he is."

He banked his plane so as to get on the other ship's tail and throttled all the way forward in an effort to catch up with him. Sure enough, the other pilot reduced his speed and in a few seconds they were side by side, only a few yards separating them. The American blinked and then laughed as loud as he could. His "enemy" was a French flier he had known very well during the war. The Frenchman laughed, too. A year or so later they met again in Paris and the Frenchman said he had heard that the American had

joined the "hostile" forces and he merely flew over to find out whether this information was correct.

They laughed again over it and recalled how they had "played tag" in the air, done a little tail-chasing, fired a few shots out of range and finally, wearying of that, peaked for home.

"And say," the American added, "you could never guess what happened when I landed. The entire city had turned out to watch us and everybody thought we were actually fighting. They made me a hero and I was given a medal. I tried not to take it but I couldn't speak the language and they were offended when I refused so I changed my mind."

Many incidents of this sort also occurred in the war in Northern Africa between Spain and the Riffs. Quite a few American pilots were in Paris when these countries took up arms. An agent for the Sultan asked one of the Americans to help him organize an air force.

"It is important that we start as soon as possible," the agent cried excitedly. "How long do you think it will take you?"

"First," said the American, "tell me the most time we have,"

"Two months at the most—we are desperate."

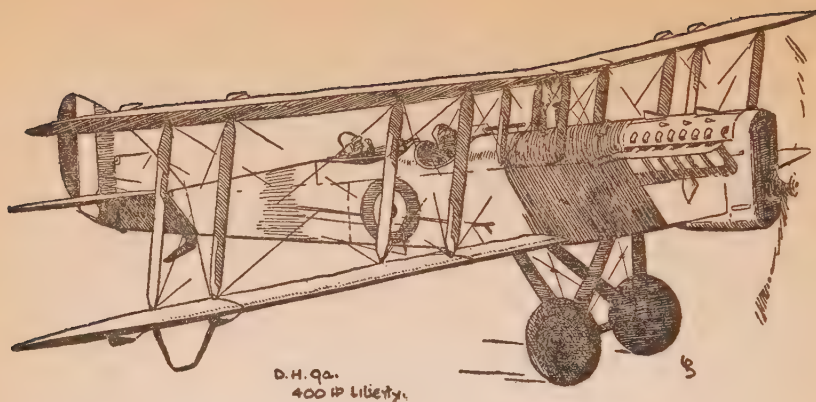
"Very well. Meet me here tomorrow."

When the agent returned the next day he found a gay, chatting crowd of young Americans, Englishmen and Frenchmen in his friend's apartment.

"A reception?" he inquired.

"Yes, for you," replied the American. "I want to introduce you to the Riff Flying Force. We are already organized, have our officers elected and are ready to leave Paris tomorrow!"

And they did!



## CHAPTER X

### AIR CIRCUSES AND BARNSTORMERS

AT THE end of the World War there were hundreds and hundreds of pilots who hoped to make their living in commercial aviation. Things went well with the fliers in Europe but in America ex-service pilots ran into a series of ups and downs that would have quickly discouraged less brave and resolute men.

European governments made money grants to their commercial flying companies and it wasn't long before air transport lines crisscrossed the continent. Airplane factories over there that had been turning out war planes started to build all kinds of commercial ships, from the large air transport cabin planes down to little two-seaters for instruction at private schools.

But here in America the pilots could not even buy good ships. Some of the fliers, and they were considered the lucky few, were able to get Jennies from the army's war surplus. Others bought planes that had been condemned—old Avros, Canucks, Standards, LWF's and sometimes a DH-6.

Those who were able to get any sort of plane at all found that they had solved only half the problem. The next question was, "How can we turn our ships to commercial use? How can we make money with them?"



The people in America did not take eagerly—or even kindly, many of them—to aviation after the war. Wherever the pilots went they heard the remark:

“The war is over and the sooner we forget about airplanes the better.”

Just imagine how that made the fliers feel! It took stout hearts, indeed, to take these rebuffs with a grin. But our pilots were equal to it. They realized that America had dropped far behind Europe in aviation before the war and now she was showing every sign of doing so again. So the ex-service pilots took a hand. They organized flying circuses; they became “gypsy fliers”; they barnstormed the country from end to end.

Knocks and jolts came from right and left but they were not discouraged. They often had to go without food to pay for parts and repairs for their planes. They slept under the wings of their ships in the open fields. They risked their lives day in and day out, flying among mountains and over dangerous stretches of the country they had never seen before. But they were happy—happy because they were flying. The feel of the “upper spaces” was in their veins. They simply had to fly.

The air mail, although in the beginning it was so small that it was seldom thought of, did something in the early years to awaken Americans to the possibilities of peacetime flying. But before we go over the history of the air mail, let's look a little closer into the doings of our gypsy fliers and air circuses. They did many interesting things.

Of course, exhibition flying and air circuses, although the latter were not known by that name at the time, had a place in American aviation long before the war. In fact, the United States had its first aviation meet as far back as January, 1910. It was held at Los Angeles from April 10 to April 20. During these ten days, which were packed with thrills for crowds at the field, balloons, dirigibles and airplanes were in contests and exhibition flights.

Louis Paulhan, who brought with him from France two Blériot and two Farman planes, was the sensation of the meet. Among the American pilots who competed were Glenn Curtiss and his fliers,

Lincoln Beachey, famous for his up-side-down flights; Roy Knabenshue, who was made manager of the Wright Exhibition Company less than two months after the meet; and Charles F. Willard, America's first exhibition flier.

The success of the first meet started things off with a rush and before the year was out, on December 24, to be exact, Los Angeles held its second flying meet. At this one Glenn L. Martin was the only amateur who qualified. In the meantime Curtiss, Willard and "Bud" Mars gave Memphis, Tennessee, five days of air thrills, which marked the beginning of the extensive exhibition flying done by Curtiss fliers all over the country in following years.

Other famous meets quickly followed in large cities throughout the United States and on March 1, 1914, Bert Berry made the first parachute jump from an airplane in public. Berry leaped from a Benoist "pusher" type—that is the propeller was at the rear—piloted by Antony Janus. The flight was made at Jefferson Barracks, Missouri, near St. Louis.

The parachute was packed in a cone-shaped sort of bucket, which was fastened to the foot-rest of the machine. Berry climbed down from his seat, thrust his legs over the trapeze, fastened a belt and dropped. The jerk of his fall yanked the parachute from the container and the brave man floated down.

Less than two years after flying the first parachute jumper, Janus went to Florida and on January 1, 1914, began operating the first air transportation line in America. In reality this was simply a flying boat ferry service between Tampa and St. Petersburg. He charged five dollars a trip and carried 187 passengers during the first month he operated. From this we would judge that he found enough passengers to keep up a fair business. Passenger-carrying has always been a great boon to pilots and when the war fliers started out to make their living in commercial aviation most of them hoped to make their money by taking up people for "joy hops." The fliers soon learned, however, that there were many other ways of turning their "air time" into money.

A common source of revenue to commercial fliers was dropping advertising circulars over towns and cities. In some places they ran

into trouble because distribution of hand-bills was forbidden by law. Clever pilots got around this, however. They would fly out beyond the city limits and drop the circulars over a county where the law did not exist. There was nothing to stop them from doing that. Then, the wind very kindly brought the fluttering leaflets right back into town and the fliers collected their fees.

If the pilots were brought into court they explained what had happened. Often the judge smiled at the excuse and let the flier go with a warning to watch the wind direction the next time. At other times a fine was imposed and this was paid by the advertiser.

Aerial photography was another source of income for fliers. They sold their pictures chiefly to newspapers but there were many other customers too. Engineering companies often were glad to get air photographs of locations where they were going to construct bridges, viaducts, docks, or start other large building operations. Some of the famous summer hotels and resorts bought air photographs to use in their advertising and many large factories bought them for the same purpose. Post card printing firms also wanted aerial views of historic spots and famous landmarks and cities. The first aerial photograph in the United States, by the way, was made from a balloon in 1874 by T. H. Johnson.

Post-war commercial aviators also made a small amount of money by selling advertising space on the wings and fuselage of their ships. Oil companies, automobile accessories manufacturers and motor car dealers were large contributors to fliers in this department of their earnings.

Well organized air circuses did not put out great effort for the "side-line" business but stuck more or less rigidly to their original purpose of exhibition flying and passenger-hopping. These organizations varied in size from little one-ship outfits with a two-man personnel—a pilot and a stunt performer—to six and seven-plane groups with half a dozen parachute jumpers, rope ladder performers, wing-walkers and elaborate ground show equipment.

But even these bigger flying companies were tiny in comparison with the great flying circus held in San Diego, California, on February 1, 1919. Almost every type of ship in the world took part in





TRAVEL AIR



BOEING



STINSON



BUHL



ALEXANDER



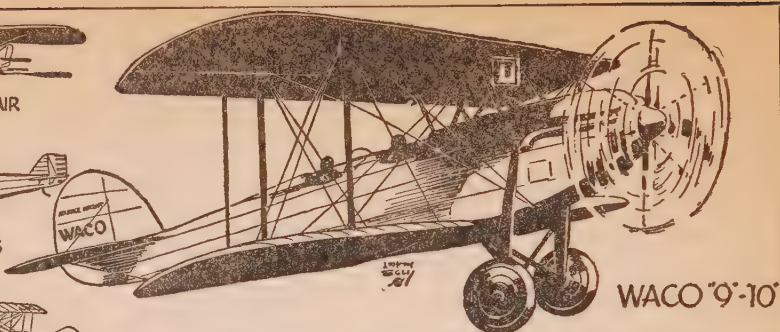
FORD - STOUT



HESS



RYAN



WACO "9'-10"

this gigantic meet. More than two hundred planes were there. They also had an elaborate ground show with numerous exhibitions of skill and comedy.

The reason the flying circuses offered a ground show as well as mid-air entertainment was to draw spectators inside the field where they would have to pay for tickets. Most people were not inclined to pay for an air show when they could sit in their automobiles along the road and watch for nothing.

The show on the ground was not the same in all flying circuses. Some of them had small automobiles which they used in polo games. Others offered such stunts as changing from an automobile to a plane right in front of the grand-stand, "hedge-hopping" exhibitions, clown antics around a plane, low altitude "bombing" and landing-to-a-mark contests.

The show in the air always included aerial acrobatics in which pilots put their planes through loops, spins, vertical banks, zooms, dives and wing-overs. There were added "thrillers" of wing-walking, stunts on a dangling rope ladder, plane to plane changes and parachute jumps. One of the air spectacles that found

great favor with the crowds was "balloon strafing." This was not difficult and there was virtually no danger in it. A paper hot-air balloon, the kind we see on the Fourth of July, was sent into the air and after it had risen a few hundred feet a plane would give chase. When the pilot caught up with it he would strike the balloon with his tail or wing skid and the paper envelope would roll over, catch on fire and fall to earth in flames.

The fact that spectators enjoyed "balloon strafing" amused the fliers. It was one of the few air stunts that people liked to see in which no one had to risk his life. How the pilots thanked the Montgolfier Brothers, inventors of the paper hot-air balloons described in the early part of this book!

Very often the various air circuses had stunts entirely their own. A flying company that operated through Texas, Oklahoma, Kansas and Nebraska carried two monkeys with them and they would drop the little fellows in parachutes made for their size.

The older of these simians, Mocko, never got used to his rôle of 'chute jumper, but Jocko, his companion did. He actually became fond of sailing down from the sky and the fliers had to keep a careful watch over him because several times he started to "go over the side" without his parachute.

Once these same fliers fastened a parachute to a hen and sent her earthward from a few hundred feet. Perhaps they remembered that the rooster and duck in the Montgolfier balloon made a safe landing. But this poor Kansas hen was somehow lacking in skill and was killed.

Tragedy was by no means limited to such experiments. The records of our post-war air circuses and "gypsy fliers" hold many sad stories. One of the strangest fatalities that ever befell a parachute jumper occurred on the Southern tour of one of the larger air circuses. When the 'chute man leaped the wind carried him over a cemetery and landed him in a tree. As he started to climb down a rotten limb gave way and his head struck a tombstone, killing him.

There are many records, too, of heroic deeds in which men risked their lives to save spectators, passengers or their companions. In one of these, so calmly did the aviators work to save a girl stunt

performer who had lost consciousness while hanging to a rope ladder that the spectators refused to believe anything but that it was a part of the performance.

Fortunately for the girl, the owner of the air circus had insisted that she wear a safety belt with rope attached to the plane whenever she performed on the ladder. On this occasion, when her hands released the ladder the rope held her dangling beneath the ship. There was a burst of applause among the spectators for what they thought was an astounding feat. But pilots who were watching knew something was wrong.

Two more ships took off at once. On the side of the fuselage of one of them was written: "DON'T LAND. WAIT FOR MY SIGNAL." In the other ships were two aviators.

When the second of these planes climbed up to the stunt ship, the extra man crawled up on the top wing panel and changed ships. In the meantime the plane with the sign on its side had got the message to the stunt plane and the pilot nodded that he understood. Without knowing just what was happening he throttled down to his slowest cruising speed.

The man who had changed ships managed, after some difficulty, to reach under the wing and grasp the safety rope that held the girl. He tugged at this and it seemed that he would never be able to pull its human burden up to the wing. His footing was extremely insecure and the risk he ran of tumbling over into space increased rapidly as his strength was used up. The crowd watched much as they would have watched a trapeze artist under the top of a circus tent, never suspecting that the very breath of death was on the brave fliers above them.

Inch by inch the heroic aviator hauled up the rope. The girl hung helpless, her eyes closed, her arms flung out. At last her limp form came up to the leading edge of the wing and the aviator reached out and took a firm hold on her safety belt. Bracing himself against a strut, he gave a mighty pull and lifted the girl to the wing, still unconscious.

The people on the ground clapped their hands but above their applause was heard a mighty cheer from members of the air circus.



The spectators did not know until the next day when they saw the newspapers that they had witnessed one of the bravest and most difficult rescues in the annals of exhibition flying.

The heroic acts of air circus and "gypsy fliers" were generally taken for granted as were their services when some unusual occurrence upset a community. Almost every commercial flier of the post-war days was called on at some time to search for a missing person. This required him to fly over forests, swamps and hilly country where a forced landing meant certain loss of his ship and more than likely, his life.

Of course, they were always glad to do this, and without any expectation of reward. That was a fortunate frame of mind for them because it was an extremely rare occurrence that anyone interested in the search so much as offered to pay for the gas the aviator used in the flights.

There were many other disappointments in post-war flying and dangers almost without number.

Sometimes a pilot would land in a town and advertise in the newspapers that he would carry passengers only to be visited the next day by a group of men who demanded that he leave town at once.

"It's like this," the spokesman would say, "we men here are the committee in charge of arrangements for the Annual Town Picnic, which is to be held tomorrow. Now, if you stay in town with that airplane everybody will be going out to see you instead of coming to the picnic. So we think the best thing you fellows can do is get out."

"Isn't that a rather high-handed way to go about?" the pilot would ask. "We have spent money to advertise in the newspapers, we have 'billed' the town, and we have already paid for the use of the field. Certainly we should be allowed to get something back for what we have spent."

"We don't care what you've spent. The best thing you can do, sonny, is get out."

The aviators' course in such a case was to try to ask these men if they couldn't join with them in the picnic and make it "bigger

and better" with the airplane as an added attraction. Sometimes it worked; sometimes not.

"No," the spokesman would continue in the latter case, "I don't think you better try that. You see, we are going to have some amusements of our own, paddle wheels and things, and we guess the people ought to spend their money on these instead of paying you fellows to fly with you. So that settles it."

"That does not settle it at all," the aviator would reply. "We have a permit to fly and if you try to make any trouble we shall appeal to the police."

Then the committee would laugh.

"If that's the case," the spokesman would resume, "you can start appealing right now because I'm the sheriff in this town."

That usually closed the interview and the fliers left, but the story is told of one quick-witted aviator who bluffed the would be bullies into letting him fly at their outing. He threatened them with rain!

To be sure, the flier could not make it rain, but at that time there had been newspaper articles on experiments being made with airplanes to produce "manufactured" rain by flying into the clouds and exploding bombs. As the experiments later proved, this cannot be done; but many people were not sure about it when this nervy pilot threatened the picnic committee with "a down-pour that will keep the folks here indoors all day."

The committee was confused, then excited. Finally they admitted defeat and the aviator was asked to fly at the outing. There was time left to advertise the airplane in the paper, the outing turned out to be many times greater than ever before, with people coming from three neighboring counties. When the pilot took off the next day his pockets bulged with crisp bills and he left behind him scores of "air-minded" people who wrote their thanks to the committee for giving them the first chance they had ever had for an airplane ride.



AIR BEACON

## CHAPTER XI

### AIR MAIL AND TRANSPORT

**A**ERICAN aviation's debt to the air circuses and gypsy fliers includes far more than the service these organizations did in giving thousands of people their first flights and removing foolish fears from the minds of thousands more. They also smoothed the path for well organized commercial flying by educating the public in aviation along many lines.

The gypsy flier is gone now. That colorful and romantic fellow will never fly in our midst again. Aviation has become a business. So is the traveling air circus a thing of the past. In their ranks were many men who are world-famous today. Almost all the great civilian fliers you can name have faced the dangers and perils of barnstorming days. Let us hope that, now, as presidents of air transport companies, airplane factories and holders of other high positions in aviation, these fellows will reap the full reward of having done so much toward paving the way for safe flying and the sane acceptance of it by those who are on the ground. For a certainty, they will never forget the dangers they have passed.



Among these the pilots recall the souvenir hunter as one of their greatest perils. When visitors came out on the field to inspect the ships, aviators had to keep a sharp lookout for the souvenir hunter. These people never seemed to realize that they were endangering the pilots' lives when they cut out as mementoes of the airplane little pieces of wing fabric!

Nor was that enough. Many of them were not satisfied with something to remember the plane by, they wanted the pilot to remember them. They sought to do this by carving their initials in the wing struts and even in the propeller! Any such mutilation to an automobile would have resulted in a prompt arrest and perhaps fine—and no doubt they knew it. But they seemed to think differently about an airplane.

Cows were another source of danger and annoyance to fliers. The wing dope—a sort of varnish which is used to make wing and fuselage fabric water-proof and taut—contains an ingredient that appeals to the taste of cows. It was necessary for the fliers to guard their planes all the time that cows were grazing in the vicinity because these sad-eyed creatures would forsake the choicest alfalfa to lick the wings of an airplane.

These dangers are now removed from flying, due largely to the establishment of airports all over the country and fliers can land without fear of cows or souvenir hunters. The number of airdromes in the United States already exceeds 1,500, with hundreds more planned. Many of these are intermediate or emergency landing fields along air mail and air transport routes. The most interesting field from a historic standpoint is Roosevelt Field on Long Island. It has been the scene of many duration flights, test hops and was the spot from which Lindbergh, Byrd and Chamberlin took off for their trans-Atlantic flights.

Fort Airport at Dearborn, Michigan, is one of the most up-to-date fields in the world, with its ample room, modern hangars and finest concrete runway in the United States.

Good airdromes set at convenient intervals are, of course, a great aid to the best service over air mail and air transport lines, and virtually every city that is situated on or near the 28,000 miles of

airways now operating in the United States has built a municipal landing field. Cities and towns are further aiding fliers today by air marking, that is painting the name of the community on building tops. The first air marking in America was at Amherst College in March 1909. It was done with white letters thirty-five feet high spelling the word "Amherst."

In the 28,000 miles of airways now operating, about half of this distance is lighted for night flying. Most of the night flying is done by air mail planes, which give to the United States the greatest aerial postal service in the world. Mail that goes by air in America is greater than that carried in all Europe combined. In this connection, it is interesting to recall that our first official attempt to deliver mail by air was an utter failure.

In 1918 President Wilson, members of his staff and a number of government officials went to Potomac Park in Washington to watch the take-off of the first mail plane. The ship was scheduled to fly to Philadelphia and turn over its postal cargo to another plane that would rush it on to New York. There were brief but fitting ceremonies for the occasion and the flying cadet who was to pilot the plane took his controls. It was a tense moment. The signal was given to start. Then it was discovered that the plane had not been fuelled.

This took a quarter of an hour. The Presidential party waited and finally the ship taxied down the field and took off. Witnesses of the departure went home and awaited word from Philadelphia that the cadet had arrived with the mail and made connection for the second leg of the trip to New York. But instead of hearing from Philadelphia, they received notice from a town south of Washington—in the opposite direction—that the cadet had landed. He had lost his way in the clouds.

The youthful flier tried again the next day but he ran out of gas and thus ended the first attempt at air mail by the United States, which now boasts of the finest anywhere. Some idea of the efficiency of the air mail today can be gained from the report that during 1928 the postal planes flew ninety-four per cent of the mileage scheduled for them by the Post Office Department.

It is true that mail had been carried by planes as early as 1911, and with greater success than that which crowned the efforts of the flying cadet. But this was an official air mail service.



LOADING AIR MAILS

The failure of the first air mail attempt was followed by three months' operation over the Washington-New York distance. Then the government abandoned the project until May 15, 1919 when a route was established between Cleveland, Ohio and Chicago, Illinois. A month and a half later this was extended to New York and in September a year later, to the West Coast by way of Omaha, Cheyenne and Salt Lake City. That was our first transcontinental air mail service. Now we have a coast-to-coast airway lighted from end to end.

In 1925 the government decided to turn over the air mail operation to private companies and advertised for bids. New air mail routes in the form of more main trunks and numerous "feeder" lines were let out later and gradually the aerial postal service spread throughout the country. The immediate demand for pilots and more pilots began to call in the air circus men and gypsy fliers from their roving over the country. The few commercial aviation training schools began to fill up with students and the schools themselves to increase in amazing numbers.



An interesting thing about the American air mail contract lines was that some of them made money almost from the start. They branched out to carry express and then passengers. In the meantime several hundred attempts in other parts of the world to make air lines pay for themselves were failures. They were able to operate only because of the money grants allowed by various governments.

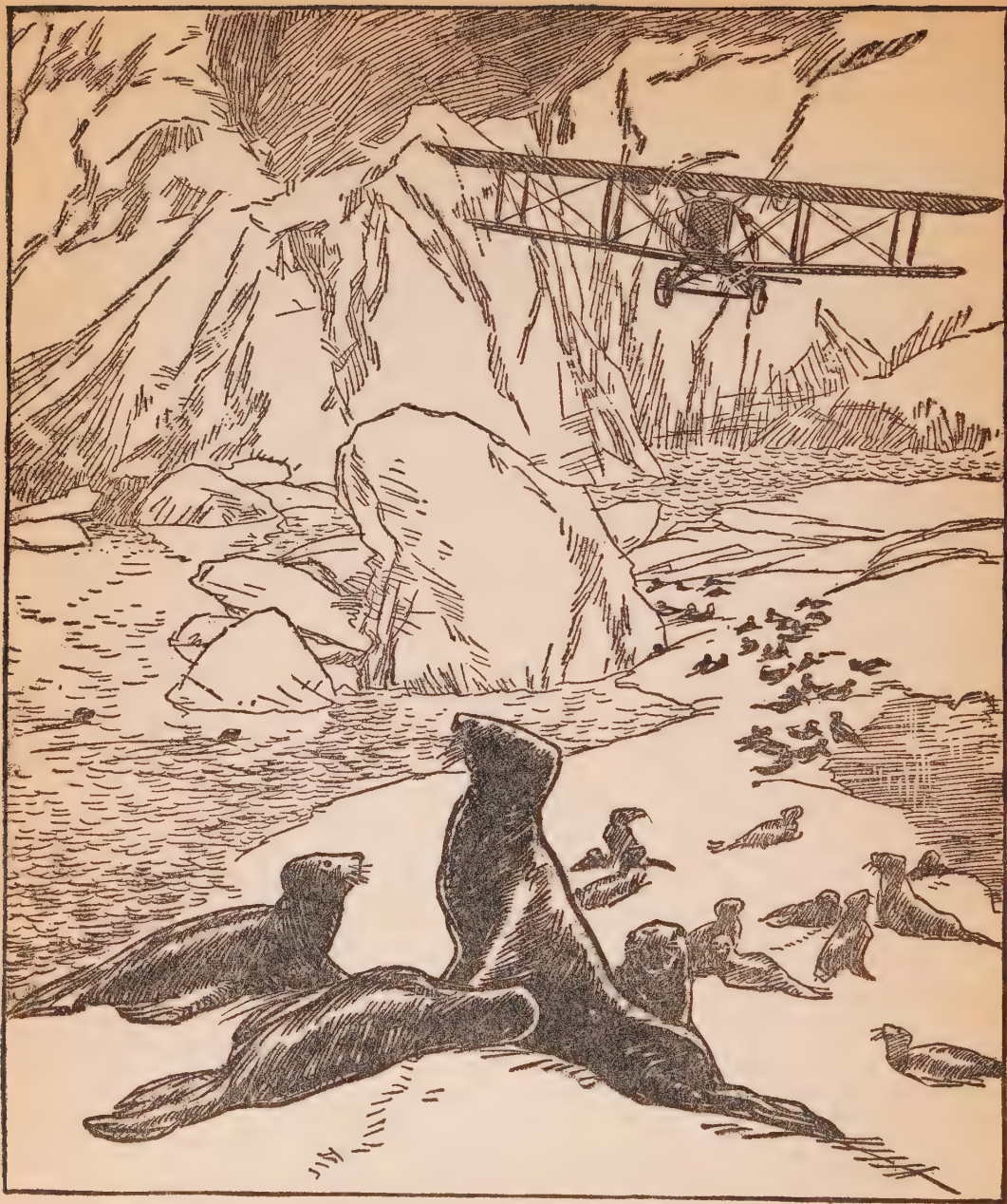
As the net-work of air mail lines spread over the United States some of the more enterprising operators saw the opportunity that South America offered to aviation. The situation demanded instant action for already German and French air firms were getting a foothold in the lower half of the Western Hemisphere.

The South American republics greeted our negotiations with considerable enthusiasm. In many places they asked why we had waited so long to come down and see them about aviation. One after another the Latin countries fell in line to sign up with United States air transport companies and one of these contracts calls for the longest air mail route in the world. This is the "run" from Cristobal, Panama, to Santiago, Chile.

A great boon to our operations to South America was the development of multi-motored planes and amphibians. The latter are equipped with a hull that will permit them to land safely on water, and wheels for airdrome landings. The wheels can be hauled up out of the way when the pilot of an amphibian wants to "set her down on the water."

As soon as the airplane manufacturers found that they could build planes that could fly with a high degree of safety they turned their attention to making the ships comfortable and luxurious. This brought many new manufacturers into the plane building and airplane accessory field. Now there are more than eight hundred companies directly or indirectly engaged in some department of aviation and aeronautical construction and operation.

These include such activities as crop dusting, aerial photography and mapping, sky-writing, carrying luminous wing advertisements, flying instructions and so forth. Many strange and undreamed of uses have come to the airplane. Dynamiting ice and log jams, spotting schools of fish, seal fishing, forest fire patrol, crop reporting



SEALS, TOO, ARE HUNTED BY AEROPLANE

and rushing belated travellers to overtake trains they have missed or to catch ships at sea are but a few of them.

These new fields for the airplane combined with the routine requirements of air mail and transport lines have created more work than the fliers and operators can handle with the equipment now at their disposal. Almost every airplane builder in the United States was far behind in his production before the Summer of 1929. The Fokker Company reported that they had on hand more than \$3,000,000 worth of unfilled orders. At the Ford plant it was found necessary to double production and turn out one plane a day. The Bellanca factory was doubled in size to take care of the rush for that famous monoplane.

Estimates early in 1929, which placed the year's plane production in the United States at between 10,000 and 12,000 ships, were declared to be far under what the actual figure must reach if the demand for aircraft in the first part of the year should continue for twelve months.

While speeding up production in their plants, the manufacturers were not forgetting to add to the speed of the planes. Stock ships were turned out in 1929 with maximum speed almost equal to the fastest pursuit planes used in the war. The trim, fleet aircraft that are built today are to the pathetic old "busses" of post-war flying days what hawks are to sparrows.

A glance at some of the air mail speed records, tabulated by the American Air Transport Association early in 1929, will clearly show how far we have advanced in this department since the days of the loggy DH's. Here they are:

"Air mail planes, which regularly maintain a 100 mile an hour speed, have often nearly doubled this figure.

"The individual speed record is held by Charles (Speed) Holman, who flew a mail plane over the 350 mile route between Minneapolis and Chicago in one hour and forty-eight minutes, an average of 185 miles an hour.

"The fastest time at which the 2,680 mile transcontinental air mail route between New York and San Francisco has been flown is 16 hours and 36 minutes, made by five pilots flying the five sections of the transcontinental airway. The mail ships averaged 156 miles an hour.

"Chadwick B. Smith, chief pilot on the non-stop air mail run between Minneapolis and Chicago led all other air mail pilots for time spent in the air in



1928, with 1,173 hours and 15 minutes. Fred W. Kelly, former Olympic hurdle champion, is in second place, twenty flying hours back of Smith. Kelly flies the mail between Salt Lake City and Los Angeles.

"Other all-time individual air mail speed records are:

"SAN FRANCISCO-CHICAGO. 1,949 miles in 12 hours 43 minutes; average speed of 165 miles per hour; held jointly by pilots J. H. Thompson, Frank Yeager and George Myers.

"CHICAGO-CLEVELAND. 324 miles in 1 hour 40 minutes; average speed 166 miles per hour; pilot, Robert Hopkins.

"CLEVELAND-NEW YORK. 399 miles in 2 hours and 13 minutes; average speed 180 miles per hour; pilot, Henry J. Brown.

"OMAHA-CHICAGO. 450 miles in 2 hours 30 minutes; average speed of 172 miles per hour; pilot, Rube Wagner.

"DALLAS-KANSAS CITY. 511 miles in 3 hours 55 minutes; average speed of 130 miles per hour; pilot, Geo. B. Grogan.

"KANSAS CITY-CHICAGO. 450 miles in 2 hours and 37 minutes; average speed 175 miles per hour; pilot, Edmund Matucha.

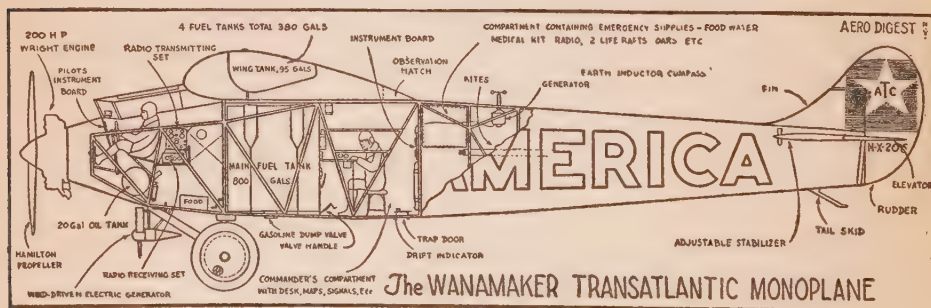
"MINNEAPOLIS-CHICAGO. 350 miles in 2 hours and 8 minutes; average speed 168 miles an hour. (Record for single motored cabin plane.) Pilot, Homer Cole.

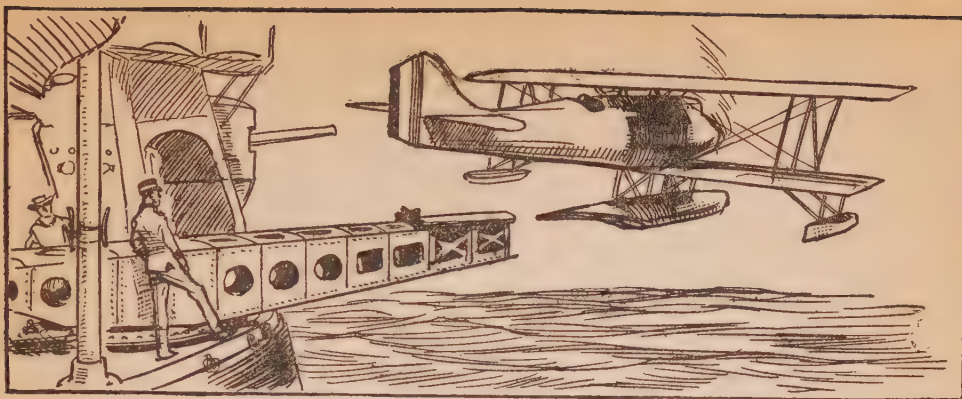
"MINNEAPOLIS-CHICAGO. 350 miles in 2 hours and 13 minutes; average speed 162 miles an hour. (Record made in tri-motored passenger-mail plane); pilot, Chadwick B. Smith.

"EVANSVILLE-CHICAGO. 281 miles in 1 hour and 52 minutes; average speed 144 miles an hour; pilot, Richard K. Peck.

"ATLANTA-RICHMOND. 484 miles in 2 hours 54 minutes; average speed 167 miles per hour; pilot, John S. Kyle.

"RICHMOND-NEWARK. 294 miles in 1 hour 38 minutes; average speed 180 miles per hour; pilot, Donald Johnston."





CATAPULTING SEAPLANE FROM U. S. A. WAR-SHIP

## CHAPTER XII

### THE ARMY AND THE NAVY

**O**N DECEMBER 23, 1907, the Signal Corps of the United States Army advertised for airplane bids. A year later the Wright Brothers delivered one of their ships to the War Department. That was the first airplane owned by any government.

It was this contract that took the Wrights back to Kitty Hawk almost five years after their first flight. Flying at Washington in the delivery of the army machine on September 3, Orville Wright carried army officers and broke all previous records. Two weeks later the plane crashed. Lieut. Selfridge was killed and Orville was injured. Official trials were then postponed and delivery of the army plane was completed the next year, the 30th of June, and Orville made a new world record.

Three months after the airplane had been delivered in Washington Wilbur Wright began the flight instruction of Frank P. Lahm and Humphreys. The third army officer taught to fly was Benjamin D. Foulois. These men, who became identified with aviation as young lieutenants, have contributed in large measure to the progress of flying and Lahm and Foulois have risen to the rank of brigadier general in the army, as we have noted in a previous chapter.

There were scores more of young army aviators in the early days who share with Lahm, Humphreys and Foulois the honor of having done much to build up flying traditions in the army. Many of these paid with their lives and all over the country now you will find army flying fields that bear their names. It has not been a rare occurrence that America lacked the best equipment and enough of it for her army pilots; but never has she lacked men who had the courage to do the best they could with whatever was at hand.

The first army airplane seemed to be enough for two years. The navy, during this time, had none. The second army purchase of planes was in 1911. Twelve ships were delivered. By this time the navy had bought four. Here is a table showing the number of aircraft purchased by the army and the navy during the following five years:

YEAR.	ARMY.	NAVY.
1912 .....	12.....	4
1913 .....	8.....	6
1914 .....	11.....	4
1915 .....	20.....	6
1916 .....	83.....	59

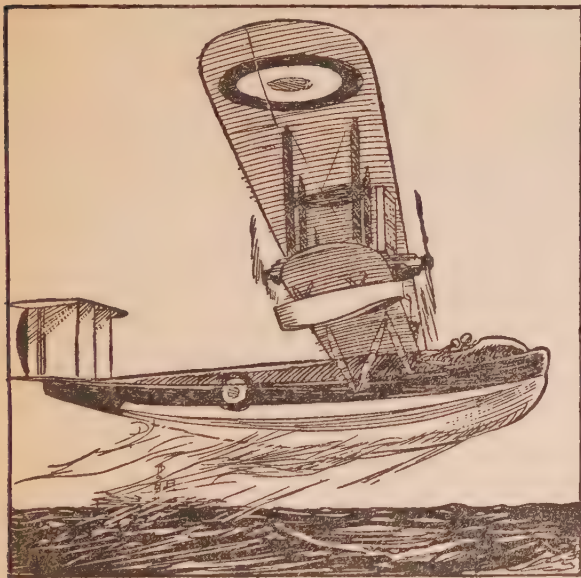
On March 15 of the last year in the above table, the First Aero Squadron began operations at Columbus, New Mexico, under Pershing. In command of the aviation unit was the third young army officer Wilbur Wright had taught to fly—then Captain Foulois. On that date the United States Army had only thirteen planes in commission. Eight of these were in the First Aero Squadron.

These ships had seen a lot of hard use in training and were described as “hardly first class, even for 1916.” But the army pilots flew them and rendered valuable service. Along with other work they carried military mails between Columbus and Colonia Dublan, a distance of a hundred miles.

This was the first tactical unit of the air service that the United States put into the field. When we consider that at that very time nations in the World War had entire squadrons of fighting ships that flew like the wind, fleets of bombers and hundreds of training planes, Uncle Sam’s first effort was a rather lame affair—from the viewpoint of equipment.



There have never been any men in the air braver than American pilots. While those first fliers of the regular army were more or less puttering around the Mexican border, hampered and all but hamstrung by a handful of worn-out planes, there were scores of young Americans flying their way to fame in foreign air services, collecting full honors with the best of them and winning the gratitude of the Allies as volunteers for the cause.



THE ATALANTA SEAPLANE

But if the army was behind the times in 1916 the navy was even more so. During that year, as we have seen by the table of plane purchases, the navy was for the first time really getting somewhere and its airplane orders leaped from six, the previous year, to fifty-nine.

Although our fighting seafarers had not done a great deal of actual air work, we cannot say that they were asleep. Much data had

been collected on the operation of the airplane in connection with battleship manoeuvres, scouting and bombing. There had even been experiments on landing planes aboard ship. As far back as 1911, on January 18, a flier named Ely landed on the deck of a cruiser and after exchanging greetings with the officers flew back to solid earth.

He set his ship down on an inclined platform that had been erected on the stern on the vessel for the experiment. His plane was brought to a stop by a series of ropes stretched across the platform, each line weighted with sand bags. The ropes were held a few inches above the boards by two wooden rails running along the sides of the

cruiser. A hook, which was attached to the tail-skid and which lowered automatically, caught in the ropes and thus the plane was halted.

The navy also had already seen use of the catapult for launching planes from warships. The catapult device, which literally shoots the plane into the air, was designed in 1911-12 by Commander W. Irving Chambers, now a retired captain living in Washington. Some people were opposed to experiments with the catapult and argued that the sudden start would be fatal to any flier who permitted himself to be "fired into the air at bullet speed."

This method of launching planes from battleships is in common use now, however, and all our large battleships are so equipped. Certain features about the catapult are known only to the United States Navy and these are strictly guarded as secrets of war.

Both the army and the navy had conducted experiments and tests with bomb-timing devices and artillery-fire control by plane prior to our entry into the World War. There had also been considerable effort in the development of lighter-than-air craft in both branches of the national defense. A number of officers had been taught airship navigation by Captain Thomas S. Baldwin, who began this instruction in 1908, and aeronautical army posts and naval air stations had been established.

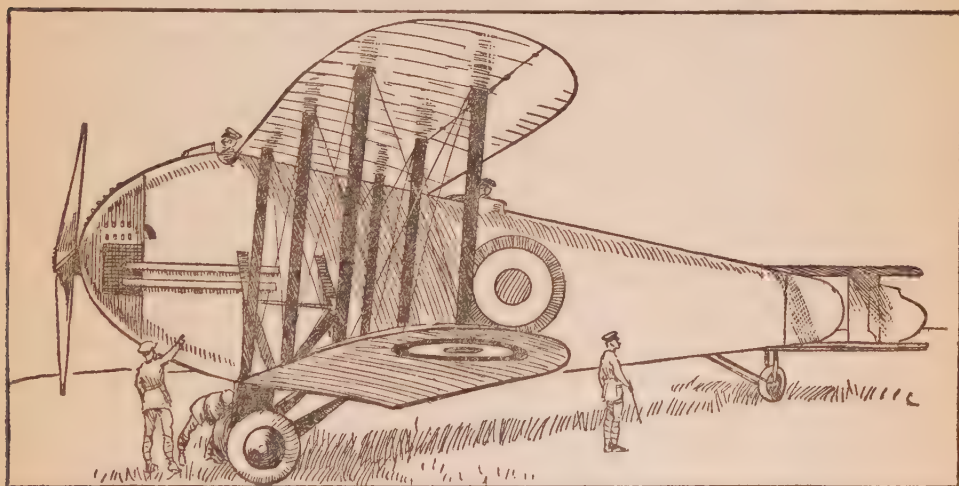
But with all this, the material and equipment placed at the disposal of our military and naval airmen was pitifully lacking. They deserve great credit for what they accomplished without the money or means to keep apace with the airplane progress in Europe, especially during the early years of the war.

They watched the flying developments with closest interest, studied the improvements in the planes and new air manoeuvres. They could not get the money to buy these new planes but that was no reason why they should let the grass grow under their feet and they did not. It was fortunate, for finally the day came when the United States entered the war.

When war was declared on April 6, 1917, just one year and twenty-two days after our first aerial tactical unit had been put in

the field down on the Mexican border, army flying was still a branch of the Signal Corps. After a few months, however, the Air Service was created as an individual arm of the service.

The Air Service trained approximately 10,000 pilots. Only a small percentage of these got overseas, however, but those who did and had their chance at the front rendered an excellent account of themselves, as we have shown in an earlier chapter. At the end of the war many of the flying men went back to civil life, some of them to resume their affairs in business, and others, such as the flying circus men and gypsie fliers, to build up a field for commercial aviation. Upon those aviators who remained with the colors fell the duty of experiment and development.



THE "CUBAROO," BRITISH BOMBER

When the war ended, and thousands of fliers were leaving the service, there arose a situation that was extremely gratifying to the high commands in the Air Service. All over the country crowds of young men who had been barred from enlistment by their youthful years, were clamoring that they were older now and wanted to learn to fly. A few private flying schools were started, but these lacked the wide range of equipment in the army, naturally, and besides,



they could never have accommodated all these eager young aviation aspirants.

A vast number of these were taken in by the Air Service, trained in aviation and commissioned in the reserve corps. Back in civil life as full-fledged fliers many of these youths were destined to astonish the world in a few years with their feats. We need mention but one of these—Lindbergh!

Enlistment periods for a course in aviation are offered by the army and navy today, and the civil aviation schools have blossomed out with amazing growth within the past two years. At the end of 1928 there were more than two hundred and fifty organizations giving instruction to student pilots.

Along with instructing the young fledgelings after the war, army and navy fliers were by no means content to spend their spare time in merely recalling what they had done. They were after new laurels—and they got them in great number!

They captured speed records, altitude records, duration records and all sorts of “pay load” and specially classed records. Europe was ahead of us, but our army and navy pilots hung on to her heels with dogged determination. The records they captured were won back by foreign fliers and won again for America. It was an exciting seesaw—and still is.

Late in 1928 the news bulletin, Domestic Air News, which is issued by the Department of Commerce Aeronautics Branch, published a list of nations holding world records. The list includes records for balloons, airships, airplanes, light planes and seaplanes. At that time there were one hundred and six recognized records covering the field. The United States and Germany led the rest of the world with thirty-two each. Here is the aerial “standing of the nations” at that time:

United States.....	32	Czechoslovakia .....	3
Germany .....	32	Hungary .....	2
France .....	20	Switzerland .....	2
Italy .....	8	Belgium .....	1
Great Britain.....	6		

When American military and naval fliers looked about for some aeronautical feat that would make the rest of the world realize we were progressing and at the same time advance the science of aviation, one of the first things they hit upon was a trans-Atlantic flight.

The honor fell to the navy. The navy had been building four gigantic flying boats, the NC-1, NC-2, NC-3 and NC-4. (The pilots called these ships the "Nancies.") These were picked to make a flight laid out from Trepassey Bay, in Newfoundland, southward across the Atlantic to a little group of islands called the Azores, then to Portugal and on to England. Plymouth was chosen as the place to land in the British Isles for it was from there that the Pilgrims set out for America in the Mayflower.

Preparations for the flight were made with great care. The navy sent out twenty-one destroyers to line up across the sea and watch for the fliers, guide them to the Azores and render aid should there be any accidents. This was to be the first flight across the Atlantic and all the world watched the United States try it.

A series of misfortunes overtook the expedition, the first of which so badly damaged the NC-2 that she was dismantled before the voyage started. Two of the ships were forced down before they reached the island group. They were the NC-1 and NC-3. That left only the NC-4 which came through with colors flying. She was commanded by Lieut.-Commander A. C. Read. His aid, Lieut.



BRITISH FLYCATCHER "TAKING OFF"

Walter Hinton, was first to step ashore and thereby earned the title of the first man to cross the Atlantic in an airplane.

The flight started May 16, 1919, and ended fifteen days later, need of repairs having incurred delays. The total distance covered was 4,791 miles. The "Nancies" were powered with four 400-horsepower Liberty engines and besides the pilot and his aid, the personnel included a crew of four men.

After this triumph by the navy it was the army's turn to step in the spotlight, so the following summer four U. S. Army fliers led by Lieut. Street flew from New York to Nome, Alaska.

Lieut. James H. Doolittle, who later became the army's ace stunt man and the first to perform the "outside loop," was next heard from. He attracted wide attention with a one-stop hop from Jacksonville, Florida, to San Diego, California, in twenty-one hours and eighteen minutes. This roused interest in coast-to-coast flights and Lieuts. Kelly and Macready took off from New York on May 2, 1923, and made the first transcontinental non-stop flight. They landed at San Diego, a distance of 2,516 miles in twenty-six hours and fifty minutes.

Nor was the navy asleep that year. Their team beat the world's fastest planes and won the Schneider trophy with a speed of 177.38 miles an hour, which set a new world's record. The navy team also produced the world's fastest plane the following year.

With the navy acquiring all speed honors army fliers quickly pulled themselves together and started the first flight around the world. Plans for a series of hops that would take them clear around the globe had been made by aviators in several foreign countries but the United States pilots stepped in ahead of them.

Douglas Cruisers, biplanes with Liberty engines, were used. Four ships left Santa Monica, California, March 17, 1924, for Seattle, Washington, the official starting point. The planes were named after four proud American cities: Boston, New Orleans, Chicago and Seattle. Ill luck befell the Seattle in Alaska, however, and she was washed out in a crash when she struck the side of a mountain while flying in a fog.



The other three planes completed the world circuit by way of the Aleutian Islands, Japan, India, Persia, Iraq, Turkey, Austria, England, Greenland, Newfoundland and back to United States soil at Boston. Then, they cut across the continent to Seattle, their starting point. At Pictou, in Nova Scotia, the Boston had been wrecked, but a new machine, Boston II. was furnished the fliers and they finished the trip with the other two.

This flight, which covered more than 27,550 miles and broke all records for distance, was accomplished in one hundred and seventy-five days. The actual flying time was only three hundred and seventy-one hours and eleven minutes. The Iceland-to-Labrador leg of the journey, which took the fliers across the North Atlantic, marked the first westward flight over that body of water.

With the Atlantic conquered by planes in both directions, the navy fliers cast longing eyes on the Pacific. A flight from California to the Hawaiian Islands, while a most difficult problem in navigation because the islands are so small, seemed the best undertaking. Two navy planes, then the new PN's, were sent to San Francisco for the hop. A third was to go but it was not ready in time. The two took off from San Pablo Bay, but one met with a mishap and was towed back. Lieut.-Commander John Rogers, in command of the other—the PN-9—flew on. When he had covered 1,870 miles of the trip, however, the fuel supply ran out and the PN-9 was forced down on the lonely Pacific. Ships had been stationed along the route to Hawaii as they had been between Newfoundland and the Azores for the "Nancies" flights, but the PN-9 settled down miles from the nearest vessel.

For days Commander Rogers and his companions drifted on the open sea, their food supply and water gone, and vicious sharks swimming in the wake of the plane's rocking hull. But they never lost their courage. They rigged up a sail made of fabric torn from the wings and actually navigated the crude craft a distance of 450 miles to the village of Lihue, on the Hawaiian Islands.

The next army record was a "dawn-to-dusk" flight from New York to San Francisco by Lieut. Russell L. Maughn on June 3, 1925. The pilot's time of twenty-one hours and forty-eight minutes

was hailed as an amazing performance. Since then, in less than four years, three hours have been clipped off Maughn's record.

The month of December, 1926, saw three spirited bids for the center-stage by a National Guard plane, ten Marine Corps ships and a Pan-American flight of 22,065 miles started by army fliers. The marines, numbering some of the country's best pilots among their fliers, sent their ships in a transcontinental flight that roused considerable attention. The marine fliers were heard from again in 1928 in Nicaragua where they put into service the first airplane ambulance.

The National Guard plane, which completed a 4,621 mile tour of the country, was flown by Lieut. E. W. Fleet and Sergeant C. F. Arnold.

The year 1927 brought to American aviation the greatest twelve-month period in the history of flying. The most famous flights were by civilian pilots but the army men were active, too. Lieuts. Hegenberger and Maitland, while a dozen planes were assembling for an aerial derby from San Francisco to Hawaii, hopped into a huge army monoplane at Oakland, California, and flew to Honolulu.

Another interesting army flight during the year was a hop by the pursuit group to Canada, where the wheels were removed from the planes' undercarriages and skis were substituted for the return trip to enable them to land on snow.

The navy was prominent again the next year and demonstrated that its giant dirigible, the "Los Angeles," could be landed on the airplane carrier "Saratoga."

However, a more important achievement for that year from a commercial viewpoint was the remarkable endurance flight record established by the army air-refuelling plane "Question Mark."

Five men took off at daylight New Year's day and did not return to earth again for one hundred and fifty hours and forty minutes. These fliers were Major Spatz, Captain Eaker, Lieuts. Quesada and Halverson and Sergeant Hooe. The ship they flew was a Fokker tri-motor monoplane. It was refuelled thirty-seven times from another ship flying directly over it.



Navy-Curtiss Seaplane Racer

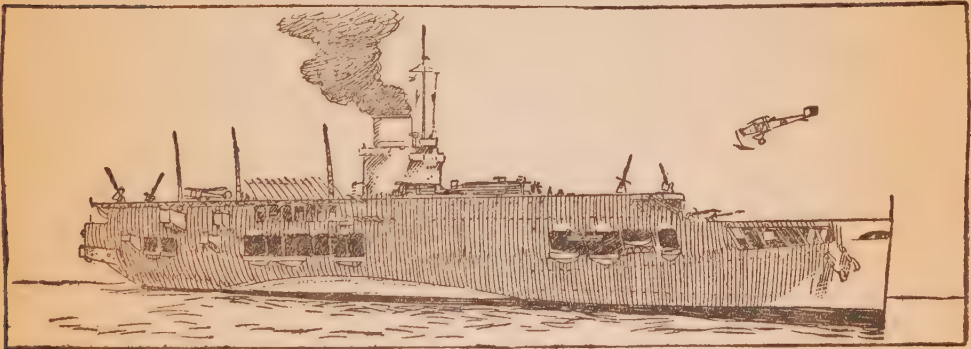




Circling around over California the plane flew a distance of 11,000 miles and its duration mark broke prolonged flight records of all times. Power was furnished by three Wright Whirlwind engines.

Major Spatz and his companions gave every indication of having an excellent time up there in the sky. Hot meals were served them by being lowered from the supply plane and this same method was used to send them their mail and such articles as they wanted to help pass away the time.

This extraordinary flight, coming as it did only a little over twenty-five years after the eleven-second hop by Orville Wright, has caused writers and students of aviation to ask the question: "How long it will be before planes and dirigibles will be so equipped as to remain aloft weeks on end?"



GIANT AIRPLANE CARRIER



THE WELLMAN AIRSHIP

## CHAPTER XIII

### CROSSING SEAS AND CONTINENTS

**P**EOPLE began trying to cross the Atlantic by air in 1873. In that year three men set out in a balloon from Brooklyn, New York. It was named the "Graphic" and was bound for Europe. But the wind blew from the south. The adventurers floated less than a hundred miles and landed in New Canaan, Connecticut.

Thirty-seven years passed before another attempt was made. This time an airship was used. Walter Wellman and a crew got aboard their craft, which they had named "America," and set out from Atlantic City. Wellman's first idea was to fly to the North Pole, but while he was getting the "America" ready Commander Peary discovered the pole so the airman changed his plans.

Wellman took with him a crew of five. These were a navigator, a chief engineer and two assistants and a wireless operator. They also had a small gray cat for a mascot. This little animal stayed with them through a hair-raising voyage of about nine hundred miles and when a storm forced them down and a steamer was stand-

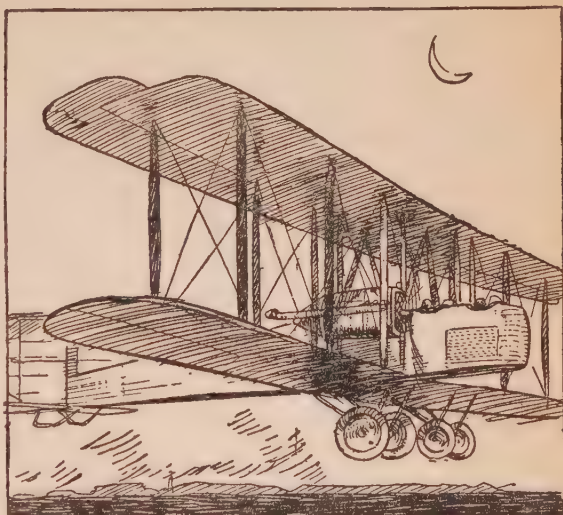


ing by to pick up the bedraggled fliers as soon as they got clear of their airship, they did not forget kitty.

Safely aboard the rescue ship one of the crew looked down at the little cat as it busied itself over a saucer of milk.

"Nine lives has a cat," said the flier thoughtfully. "Let's see, we travelled just about nine hundred miles, didn't we. Wasn't it lucky we didn't go any farther without another cat?"

The third attempt to span the Atlantic—in 1919 and this time by plane—was also doomed to failure. Hawker and McKenzie Grieve, flying an English Sopwith, built especially for an ocean hop, were forced to land on the sea a little over 1,000 miles from their English starting point. This flight was made while the "Nancies" were on their way to the Azores.



ALCOCK'S ATLANTIC AIRPLANE

The English plane was after a \$50,000 prize offered by a London newspaper for the first flight to America or vice versa. The fliers on the NC-4 could not claim this prize because the paper specified that the flight be non-stop.

Just two weeks after Commander Read had landed at Plymouth Captain John Alcock, an Englishman, and Lieut. Arthur W. Brown, an American, hopped off from St. Johns, Newfoundland, dropped their landing gear in the sea, and brought their plane across the Atlantic to Clifton, Ireland, fulfilling all conditions for the prize.

With the question of flying the Atlantic settled, airplane pilots turned their attention to other flights and the ocean was ignored for

three years. During this time Captain Ross Smith, an Australian, and his brother, Keith, made an 11,500 mile flight from London to Australia and Walter Hinton, of NC-4 fame, with four companions hopped from New York to Rio de Janeiro, Brazil and explored the South American jungles.

Aviators heard the call of the Atlantic again in 1922. On March 30th of that year, Captains Cabral and Coutino made the first crossing by the southern route. They flew a Fairey-Rolls seaplane and made stops at three islands in crossing.

Two other long flights were made in 1924. One, by two Frenchmen, was from Paris to Shanghai and the other by an Argentine pilot from Amsterdam, Holland to Tokio, Japan.

An airplane again crossed the Atlantic two years later. Major Roman Franco with three companions flew the southern route with stops at several islands. He landed at Pernambuco, Brazil.

During the seven years between the \$50,000 prize-winning flight of Alcock and Brown and September 21, 1926, there had been no attempt to capture the flight reward which had been posted by a Paris hotel operator for the first flight either from New York to the capital of France or in the other direction. On that date Captain René Fonck, whose brilliant war flying has been mentioned in preceding pages, attempted to take off for Paris from Roosevelt Field, Long Island, in a specially built Sikorsky biplane.

But the plane did not rise before it reached the end of the runway and it crashed. The heavy load of gas spilled over the hot engines and two mechanics who were unable to get out of the wreckage were burned. Fonck and an American naval officer, who was to accompany him as navigator, were unhurt.

There were twenty-one attempts to fly over the Atlantic in 1927. Seven were successful, eight were abandoned and six of the expeditions got off and were lost in the ocean. The most heroic of all these was Lindbergh's hop from New York to Paris.

Three of the seven successful ventures were over the Southern Atlantic; the other four followed the "Great Circle" to the north.

The first flight was from Senegal to Brazil in an Italian Savoia seaplane. Commander Francesco de Pinedo was in command. That

was in the latter part of February. He attempted to fly back from Trepassey Bay to the Azores, using the route of the NC-4, but landed on the ocean one hundred and sixty miles from his goal and was towed to port.

The other two hops over the Southern Atlantic were made by Frenchmen and on one of them Captain Costes and Lieut. Lebrich made the first non-stop flight from Africa to Brazil, a distance of 1,980 miles. This was the beginning of a world tour for these Frenchmen and covered some 35,800 miles, beating the distance of the army "Round the World" fliers by more than 8,200 miles.

Lindbergh led the way over the "Great Circle." Next was Clarence Chamberlin, flying the first of the famous Bellanca CH planes. With Chamberlin, was Charles A. Levin, the first trans-Atlantic passenger. Their hop took them from Roosevelt Field—we are to hear a lot about this famous airdrome from now on—to Eisleben, Germany. They intended to go to Berlin but their fuel supply ran out a comparatively short distance from the German capital.

Following Chamberlin was Commander Richard E. Byrd, former naval officer and already a veteran of one of the most famous flights in history—the first hop to the North Pole. This trip was made in the "Josephine Ford," a tri-motored Fokker, piloted by Floyd Bennett. They took off from King's Bay, Spitzbergen and flew to the North Pole where Byrd took observations, dropped evidence of the visit which included the Stars and Stripes and returned to their base. The round trip was made in fifteen hours.

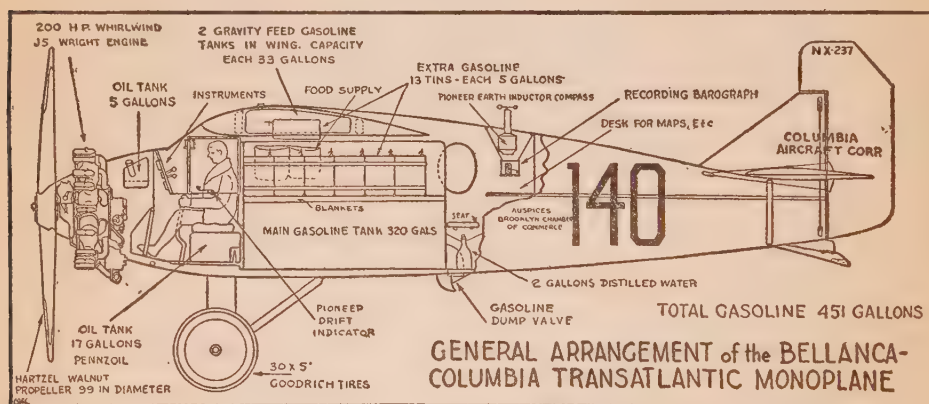
Byrd had the highest faith in the flying ability of Bennett and only an accident in which Bennett was injured prevented the naval pilot from being with his comrade of the sea when Byrd's plane, the "America," left Roosevelt Field for that eventful flight to the French coast.

Three men were with Byrd on the flight. They were Bert Acosta, pilot; Bernt Balchen, relief pilot; and George O. "Rex" Noville, in charge of radio. Bad weather kept these fliers "grounded" week after week at Roosevelt Field until June 28 when weather reports said there was a possibility of calm conditions. At



daybreak the four men were at their posts in the ship. The three engines whirled their propellers without a flicker of discord. The signal was given and the great plane ran down the special ramp that had been built for her and sped along the runway. A few feet from the spot where the year before Fonck's Sikorsky crashed and burned, the America rose in the air.

A light rain was falling but the skies cleared later and a cheerful sun shone on them until they left the Grand Banks. Here they plunged into a heavy fog which held them blinded until Bernt Balchen finally set the plane down in the water a few yards off-shore at Ver-sur-Mer, France.



The seventh Atlantic flight in 1927 was that by Brock and Schlee. They took off at Harbor Grace, Newfoundland, and landed at the great flying field at Croydon. This was the first non-stop flight to England. They continued winging their way across Europe and Asia in their Stinson land plane to Japan. There they announced that they would fly the Pacific and this brought hundreds of protests from friends and public men begging the fliers not to attempt so perilous an undertaking. They remained firm in their plan but much to the relief of their friends, bad weather interfered until weary of waiting to be on the move, the fliers returned to America by steamer.

The Atlantic was not the only ocean attracting aviators in that memorable year of 1927. Out on the Pacific four planes made the hop to Hawaii, five expeditions were halted by mishaps of one sort or another, and three planes were lost at sea.

We have already seen how Hegenberger and Maitland jumped ahead and made it before the Dole Derby entrants got started. These army fliers were followed by Ernest L. Smith and Emory B. Bronte, who flew a Travel Air monoplane from Oakland, California to Hawaii on July 13-14, just two weeks after the army plane landed on the islands.

A month later Arthur C. Goebel and William V. Davis landed in Honolulu after making the flight from Oakland in twenty-six hours and seventeen minutes, thereby winning first prize in the Dole Derby. Second was Martin Jensen and Paul Schleuter in a Breese land monoplane, the "Aloah." Goebel called his ship the "Woolerac." His time beat that of Jensen by one minute less than two hours.

When this important year of flying drew to a close some students of aviation predicted that its achievements would never be equalled in sheer daring. But the following year found fliers all over the world quickening to the happy task of bettering old records. Many of the old records fell, but some of them did withstand all-comers.

Among the latter was Lindbergh's solo Atlantic flight. No other pilot has flown the ocean alone. The distance record set by Chamberlin fell before a flight from Rome, Italy, to Port au Natal, Brazil, a distance of approximately 4,400 miles, which beat the Columbia's hop by a few hundred miles.

The attempts by women to make an ocean hop was at last realized by Amelia Earhart. But this did not come until one woman had been lost in the Pacific, three in the Atlantic and a fourth all but missed perishing when a steamer rescued Ruth Elder and George Haldeman near the Azores.

One of the important flights of the year was the race around the world by Charles B. D. Collyer and John Henry Mears. Collyer, a former sky-writing pilot, flew a Fairchild plane, "City of New York," across Europe, Asia and North America. The water jour-

neys were made by the fastest steamers. The globe-girdlers succeeded in lowering the time to get around the world from twenty-eight days and fourteen hours to twenty-three days and fifteen hours.

Another flight that commanded universal admiration was the flight over the "Great Circle," the North Atlantic route from Ireland to Labrador by the German plane "Bremen." In the ship were Baron von Huenefeld, Captain Herman Koehl, German fliers, and Colonel James Fitzmaurice, an Irishman.

In the meantime two more trips had been made over the North Pole by air. In one of these Sir Hubert Wilkins, with Carl Ben Eielson, an American pilot, made the hop in a Lockheed Vega with Wasp engine. The other polar trip was made in the rigid dirigible "Norge" by Roald Amundsen, famous explorer; Umberto Nobile, Italian pilot, Lincoln Ellsworth, an American who backed the flight; and a crew of men.

Nobile later attempted another polar trip in the dirigible "Italia." His craft met with a mishap in the northern stretches, however, and the craft was blown away, carrying with it a part of the crew. Some of those who managed to land, including Nobile, were rescued by Norwegian fliers.

The first trans-Atlantic flight in 1929 went to two Spanish pilots who crossed from their native country to Brazil by the southern route. The early part of this year also witnessed a complete aviation triumph over the Pacific. The "Southern Cross," a Fokker tri-motor monoplane, bearing two American fliers and two from Australia, made a hop, skip and jump trip from California to Australia, stopping at Hawaii and the Fiji Islands on the way.

The coast-to-coast flight record also came to the attention of civilian fliers this year and Captain Frank Hawks, carrying Oscar Grubb as mechanic, made the jump in eighteen hours and twenty-five minutes. They flew a Lockheed Air Express with Wasp motor.

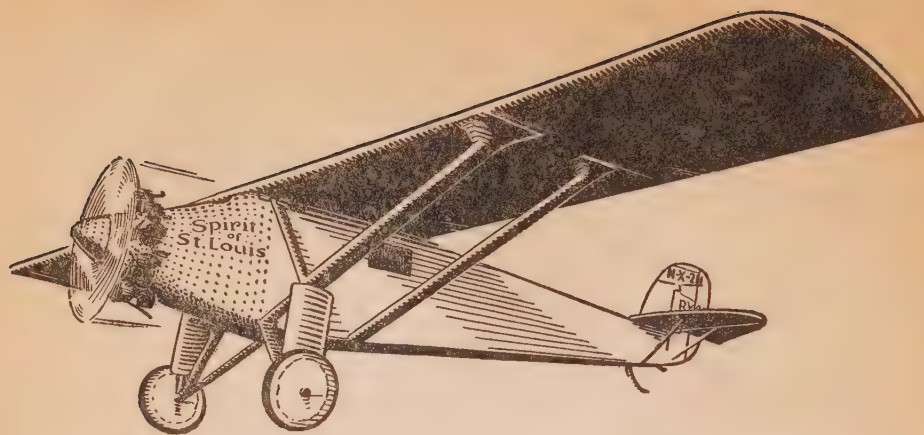
Captain Hawks landed at Roosevelt Field, Long Island. He told the crowds there to greet him that his great speed was in part due to the Reich-Carroll cowling, developed by the National Advisory Committee for Aeronautics at Langley Field, Virginia.



This experimental organization was authorized by the government a number of years ago and their work has had to do exclusively with the scientific phases of flying. They have built extensive laboratories and wind tunnel tests for new types of ships have been a feature of their work.

But more interesting, perhaps, is the work these scientists are doing toward the development of an oil-burning engine for planes. Many aviators who have studied the committee's reports believe that the day is not far distant when light, powerful engines of this type will be available to airplane manufacturers. Then, they say, the present duration, distance and altitude records will be as greatly overshadowed as they now tower above those of Wright and Curtiss.





## CHAPTER XIV

### "I AM CHARLES LINDBERGH"



**W**E HAVE seen how the army, navy and air mail pilots as well as the exhibition and gypsy fliers spread the word of aviation over America. But with all this, there was still one thing needed really to wake up the country. It needed a spectacular hero. Lindbergh quietly filled this need.

Charles Augustus "Slim" Lindbergh was a very young man when he went out to Nebraska and started flying lessons at a private aviation school. When he finished he bought a ship and in a short time he received word that his application for army flight training had been favorably passed on. He climbed into his ship—it was typical of the ships of those days, rather a pitiful affair—and flew down to Brooks Field.

So eager was he to get there that he arrived ahead of his papers from Washington. Things were soon adjusted, however, and the tall, blond, youthful cadet was assigned to a flight instructor named

William A. Winston. "Bill" Winston's middle name was also Augustus. He took a keen interest in his cadet.

Lindbergh finished his course in 1925. He went to Denver and flew for the Mile-Hi Airways. After a time he went into the air mail, and flew the route from St. Louis to Chicago. During this service he had several narrow escapes from death.

More than once he was forced to "go over the side" in a parachute when his engine failed. These leaps made him a member of that strange organization among fliers known as "The Caterpillar Club." Any aviator who is forced to leap from his plane because of mechanical trouble is admitted to membership at once in the Caterpillar Club.

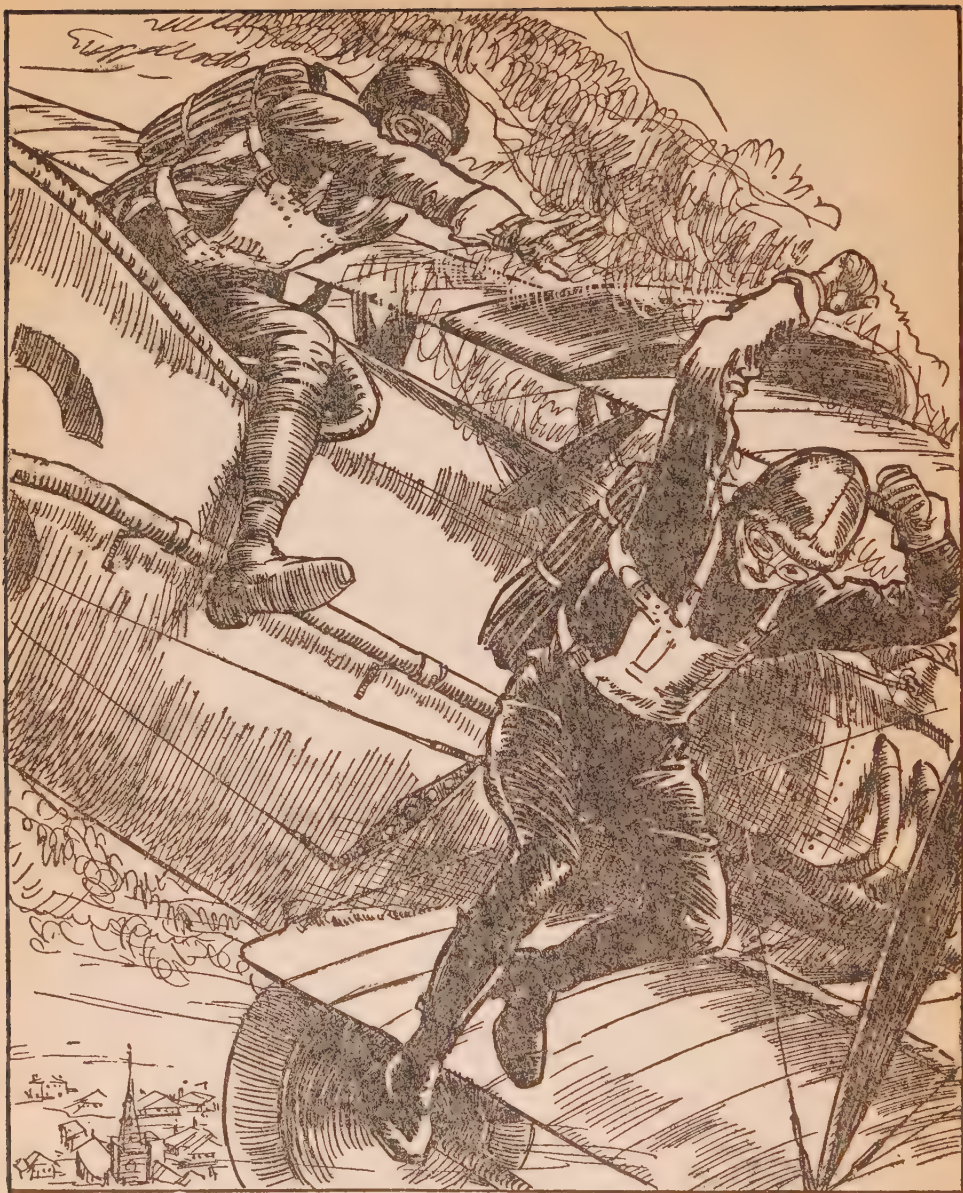
The air mail service in those days was a terrific grind. But the tall young pilot didn't mind that; as long as he was flying he was happy. He had in him the spirit of the old war fliers who stuck to aviation in those dangerous "starvation" days after the war. He had done exhibition flying himself, too. Stunting was nothing new to him and flights of great importance always roused his keenest interest. He was reading about René Fonck's crack-up at Roosevelt Field in an attempt to take off for Paris when it suddenly occurred to him that he might try the Paris hop himself.

The trials and tribulations in getting some sound-thinking business men to back such a proposition were many. But the determined young man finally persuaded a group of St. Louis men to finance him.

Out in California he found a plane that gave him considerable confidence in a successful outcome of the flight. It was a Ryan high-wing monoplane, powered with a Wright Whirlwind engine of two hundred horsepower. His flight to Paris really started at San Diego, where he bought the Ryan. Reckoning along these lines, the flight has been called Lindbergh's "hop, step and a jump" from California to the French capital.

Lindbergh flew from the West Coast to St. Louis, then hopped to New York. He landed at Curtiss Field, Long Island, just a few moments before Commander Byrd's Fokker tri-motor came over to Roosevelt from Teterboro Airport, New Jersey. "Casey" Jones and





JOINING THE "CATERPILLAR CLUB"

M. M. Merrill were on the steps of the Curtiss Field flight office when the silvery monoplane appeared. Ryan planes were not known in the East at that time and "Casey," who is president of the Curtiss Flying Service pointed it out to Merrill, who was manager of the field.

After a searching look, Merrill suddenly announced:

"Why, that's Charles Lindbergh, the young chap who is going to attempt a solo hop to Paris."

When Lindbergh taxied the "Spirit of St. Louis" up to the line Jones and Merrill walked over and extended the courtesy of the field to him, had his ship put in a hangar and offered their services.

The young blue-eyed flier's stay on Long Island was a brief one. He watched the weather reports carefully for he was eager to be away. He was, and has remained, extremely modest about himself. Nothing shows this any better than his request for a letter of introduction to the American Ambassador in Paris.

At last the weather charts indicated good conditions over the Atlantic and Lindbergh ordered his ship ready to take off from Roosevelt Field at dawn. The instruments had been checked for accuracy and the plane already had been fuelled for several days.

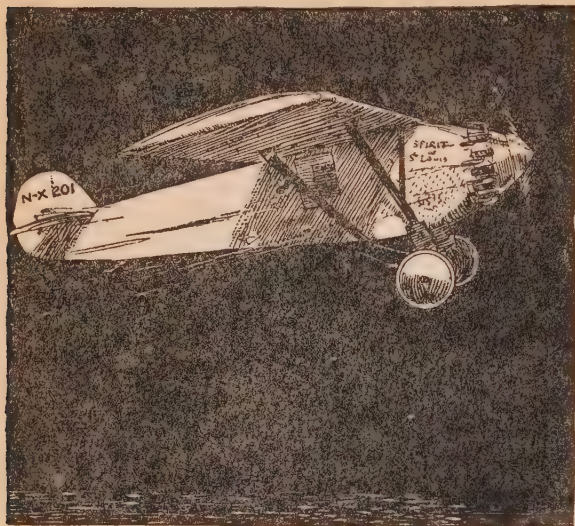
A large gathering of Long Island people and scores of newspaper reporters and cameramen were at the field when Lindbergh appeared. His rations—those famous sandwiches—were handed to him and he climbed into the cabin of the Ryan. There were a few moments of suspense while he "revved up" his engine; then he nodded to mechanics to drag out the wheel chocks.

There had been a light drizzle of rain and some of the fliers who watched the final preparations feared that the ground was too soft to make possible the take-off of the heavily gas-burdened ship. But the daring pilot was ready to go and tired of waiting. He glanced through the cabin window with a wistful smile at the crowd then "gave her the gun."

The tail of the ship rose and she started down the runway, swaying over the soft ground and splashing through little puddles. She seemed to be hugging the ground over long. There were wires at the end of the field that she would have to get over. Several auto-



mobiles were started—you can't tell about these things. Hadn't Fonck crashed in a take-off for Paris right here?



LINDBERGH'S "SPIRIT OF ST. LOUIS"

"Now he's off!" came a cry from the crowds. But there was a quick hush. The plane was heading directly into the wires. Fear ran through the spectators like a chill. Can he make it? Pilots tugged at imaginary sticks. "Get'er up; get'er up" they moaned aloud. But Lindbergh kept her nose down to the very last fraction of a second. Then—

"Hooray!" Hats were tossed in the air and everybody was talking to everybody else. War pilots ten and fifteen years older than Lindbergh exchanged knowing nods.

"That boy can fly! How that boy can fly!"

Up the Atlantic coast flew the silver plane in the clear morning. Cities along his route sent wire messages to the rest of the world that the "Lone Eagle" had passed over. Good weather continued throughout the day but that night when Lindbergh was out over the ocean he ran into fog, winds and rain. His plane was tossed about by air currents that held their windy sway for hours. He tried various altitudes for a calm stratum of air. At times he was high above the churning sea; at times down barely skimming its threatening surface.

Finally the flier emerged from the turbulent zone. Taking his bearings he found that he was still true to his course and when he sighted land, this natural-born navigator as well as born pilot, found that he had not veered even so slightly from his mapped route.



A crowd of fifty thousand people were waiting for this young American at Le Bourget, the famous flying field outside of Paris. The French gendarmes had all they could do to hold the throngs in control as soon as word was flashed ahead that he should be there soon—this modest fellow who brought along with him a letter of introduction!

At last the shiny gray ship came to rest at its goal—Paris! When a breathless group of officials, who had dropped all their French dignity to run out to meet the American youth, came up to the ship the flier opened his cabin window and thrust out his head.

"I am Charles Lindbergh."

He said it quietly and seriously. He did not realize that those thousands of people out there were really waiting for him.

"We know you're Charles Lindbergh," the dignitaries shouted. "We know it, brave man. All the world has been watching you. Come, Paris is waiting to hail you!"

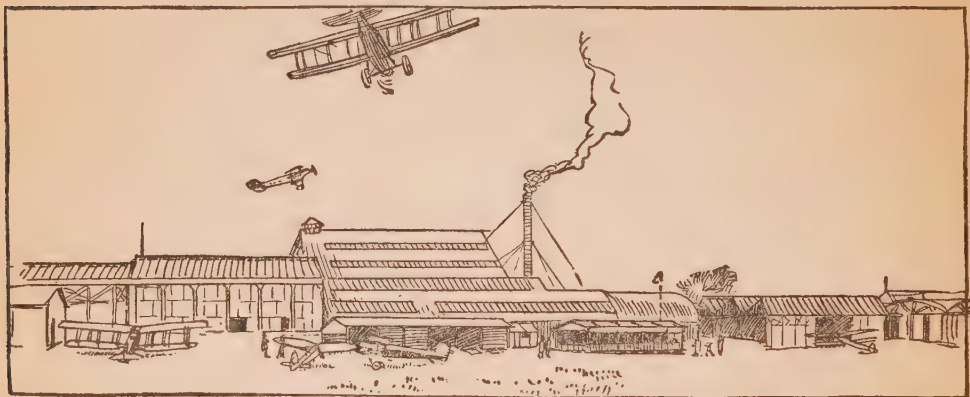
And Paris did. His stay among the French was all but a national holiday. Then he went to England and was received by King George. King Albert received him in Belgium and monarchs all over Europe asked this "first Atlantic solo pilot" to visit them. Time was too short, however, and Lindbergh returned to America aboard the U.S.S. "Memphis," a cruiser sent by the navy to bring him and his beloved plane back.

The day he arrived in New York will never be forgotten by those who saw that great city's welcome to Lindbergh. No king, ruler or conquering general in the history of the world ever had a reception to equal it. Newspapers estimated that more than four million people witnessed the triumphant ride of "The Lone Eagle" from the Battery to Central Park.

A less serious aviator would have been satisfied to rest on his laurels, but not Lindbergh. Nor did he allow his fame to be turned into money. This "greatest hero of all time" was soon back at his work—flying. He made a tour of the country that required him to fly a total distance of twenty-two thousand miles. And as soon as that was over he made his famous good will tour of South America.

Then followed other flights; flights in which he sought to convince America that aviation must be developed here.

And time and again, Col. Lindbergh has said, as all other great fliers have said, "Give our boys aviation. American boys are natural aviators—all of them. Teach them to fly and America's future in this field will never be in doubt."



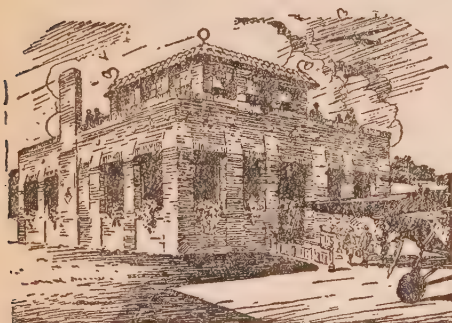
THE FAMOUS "DH" PLANT IN ENGLAND





Other railroad presidents heard about this and all over the country plans were begun for the air-rail mode of travel. The railroad executives went about their work with customary speed and efficiency. In less than three years after Lindbergh's return from Paris five combined air-rail passenger lines had started operations between the Atlantic and Pacific.

"The Lindbergh Line" and "The Great Circle Line" are two of the most important plane-train routes of the new systems. On their initial schedules they reduce by two days the all-train travel time between the Atlantic Seaboard and the Pacific Coast.



AIR PASSENGER DEPOT BEING  
CONSTRUCTED AT FORD AIRPORT

Passengers taking "The Great Circle Line" leave New York at night by Pullman and arrive at Cleveland the next morning. They are served breakfast at the airport while giant fourteen-passenger planes are made ready for the air stage of the journey, which is operated by the Universal Air Express from Cleveland to Garden City, Oklahoma, a distance of a little more than one thousand miles.

Luncheon is served during the flight and a uniformed attendant is at the service of the travellers. At Garden City the passengers change to train again and so continue to California. The total time is about sixty hours.

On "The Lindbergh Line" passengers leave New York at night and board a plane the next morning at Columbus, Ohio. They breakfast at the airport, as on "The Great Circle Line," and also have luncheon en route by air from Columbus to Waynoka, Oklahoma. There they board another train. Next morning they awaken in Clovis, New Mexico, where another transport plane is waiting to take them on to the West Coast. The trip over this route requires only about fifty hours.

The third of the great transcontinental air-rail services is by way of St. Louis; the fourth makes connections at Chicago and the fifth at Kansas City. These five systems added 10,000 miles a day to the 45,000 total which passenger planes were already flying every twenty-four hours.

The eagerness of travellers to use air service routes has been the chief force, we might say, behind the vast development of the American aerial transportation system. Today there are more than fifty passenger air lines operating on regular schedule throughout the country and carrying thousands of passengers each week. The main trunk lines, with their numerous "feeder" lines, penetrate every section of the United States and reach out far into Canada, Alaska, Mexico, Cuba, and Central and South American countries.

The success of the air-rail hook-up has led aviation authorities to predict that we are soon to see airplanes as an important link in ocean travel. Many of the great trans-Atlantic shipping interests are already at work on plans for airplane ship-to-shore service. This, if the plans work out satisfactorily, would enable steamer passengers who are in a hurry to get ashore to reach port two, and perhaps three days ahead of the ship.



COBHAM'S D. H. 50

The plan is to have seaplanes or flying boats come out from the port for which the steamer is bound, land along-side while the passenger transfer is made, and then fly back to port. Another provides that each ship will carry one or several planes so that a given distance from port could be bridged without the need of a flight out to meet the vessel.

The possibility of flying mail to shore long before the steamer puts in, however, is much nearer a fact. A device to aid this by enabling a plane to pick up the rush mail by a hanging cable has passed successful tests at sea and will be installed on the ocean liners of an American shipping firm.



THE CROYDON CONTROL TOWER

While we are looking at air transportation figures, it would be interesting to see what Europe is doing. The United States has made tremendous gains on European countries during the past two years, but that does not mean that air transport has been at a stand-still on the other side of the Atlantic. Far from it. Great Britain, France, Germany, Italy, Spain, Russia—all countries, big and small, have been pushing ahead on their aviation programs with good results.

The most important transportation development abroad, perhaps, was the inauguration of a 7,000-mile air-rail route between England and India. Imperial Airways planes leave Croydon, Lon-



don's famous flying field, thrice weekly for Karachi. The planes complete the first stage of the journey in Switzerland and from there it continues by train to Genoa. Here seaplanes take up the journey, which follows through the Orient to India.

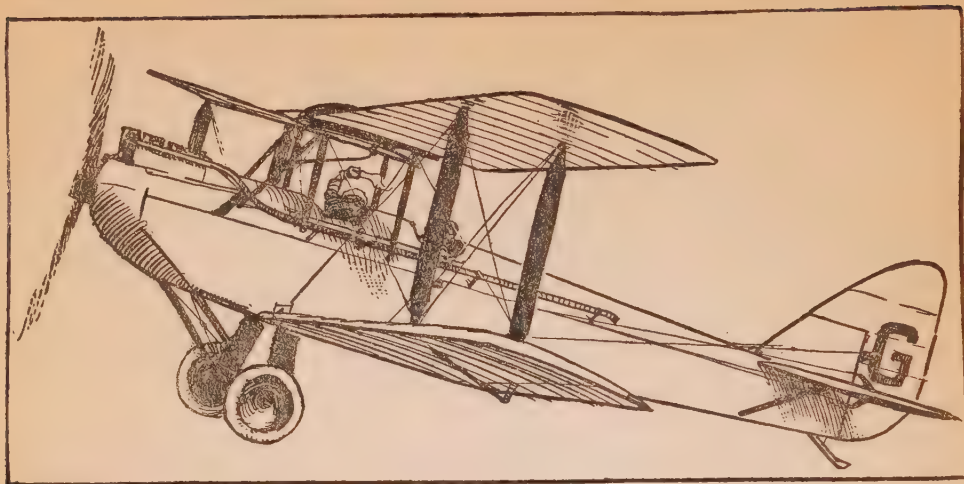
Heretofore this trip was a matter of weeks. The plane-train service, however, reduces it to seven days. This service is due to operate on a daily schedule within a short time. The British also are working on plans for a non-stop dirigible service between London and Karachi. The giant R-100 and R-101 dirigibles, of which we read in a foregoing chapter, are expected to inaugurate this route.

Aviation firms in England are also working on proposed trans-Atlantic air lines to link London with North and South America. They are not alone in this, however; France, Germany, Spain, Italy and Russia, too, are experimenting with new plane models and types which they hope will reduce the hazards of ocean flying and make regular air travel between America and Europe a safe and commonplace service.

International air traffic between European cities has moved ahead with rapid strides, especially during the past year. Before America becomes too proud of her own progress it would be worth while noting that a recent survey by the British government showed that from London one can fly to any of seventy-three European cities, all of which are connected by regular air services. The survey also showed that an average of 2,000 persons a week flew across the Channel.

The United States is watching Europe with intense interest. People over here no longer close their eyes to Europe's flying progress as they did before the World War. We have our own planes and we build them in enormous numbers, but we are also keen to watch for improvements brought out in other countries, and there are many.

During 1929 many American aviation manufacturing firms were organized for the sole purpose of building for our fliers the best planes Europe has to offer. Among these are the two excellent sport types produced in England, the Avian and the Moth, and the R.S.V. Belgian army training ship.



THE MOTH

In the class of larger ships, the Savoia-Marchetti manufacturing rights have been acquired by an American corporation. The Savoia, an Italian plane, has been used on several trans-Atlantic flights over the southern route and is holder of a number of air records. Another firm has the American patent rights on the Zeppelin and one of these of gigantic size is being built in Akron, Ohio.

In the airplane motor field, too, United States engineers have found much in Europe to bring over here. A plant has been built in New Jersey for the production of that famous British light engine, the Cirrus, a four-cylinder water-cooled motor for sport and training planes. Then, there is the Belgium training ship engine, the Reynard, a five-cylinder radial power unit. Outstanding among the high horsepower plane engines American manufacturers have acquired from Europe is the Isota-Fraschini 1,000-horsepower motor. This is a water-cooled sixteen-cylinder power plant.

But despite these importations, American aviation genius has been busy in the development field at home. Among new training planes that have made their appearance is the Curtiss Fledgling, a biplane. It is powered with a Challenger engine, a radial power unit with six cylinders staggered. Fully a dozen light or sport planes

were introduced by American builders within the year, but experts were inclined to rate them below Avians and Moths.

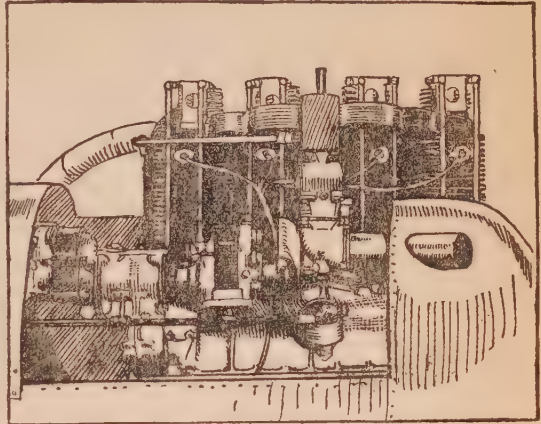
Greater progress was made by America in the transport and cabin ship classification. Largest among these was the Keystone Patrician, a twenty-two passenger plane, which made an exhibition flight from New York to California and back. The giant ship was flown by Lindbergh on the Pacific Coast. The Patrician is a monoplane driven by three Wasp motors and after its country-wide demonstration it was put into passenger service between Boston and New York.

Vincent Buranelli, who, at the age of twenty-seven, is called America's youngest airplane designer, gave the country another air giant in his

Chapman Airliner, a monoplane driven by two Conqueror engines with a total of 1,300 horsepower. A feature of the Buranelli ship is its retractable landing gear which is drawn up during flight to cut down the wind resistance. These planes eventually will be equipped with hulls or pontoons for landing at sea in a ship-to-shore service for passengers.

Also in the big plane class, but designed for the army, was the Curtiss Condor bomber which passed a speed test of 150 miles an hour. Afterwards the builders announced that this type of ship, with a capacity for thirty-two passengers, will be designed for transport service.

Planes of large passenger capacity are also being built by the Fokker Aircraft Corporation. Work has been started on five air giants which are described as America's first "Flying Pullmans." They will have comfortable sleeping accommodations for sixteen



CIRRUS ENGINE



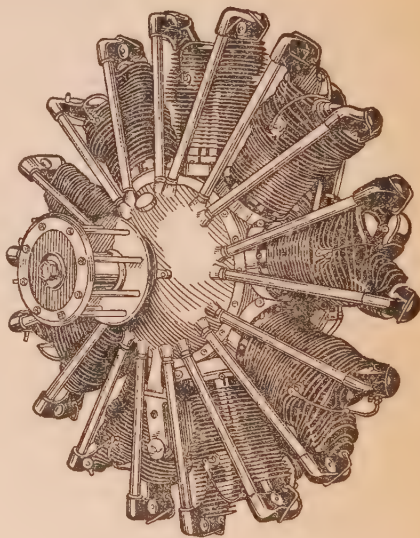
passengers in night flights and thirty passengers during day trips when the berths are made up. This DT-32 type—that is how they are designated at the factory—will carry a crew of four, consisting of two pilots, a mechanic and a steward.

The DT-32 follows the general design of the famous Fokker F-10 monoplanes. It will be equipped with four engines in tandem pairs on each side of the fuselage. With a maximum load it will have a cruising range of seven hundred and eighty miles at a speed of about one hundred and twenty miles an hour.

The Keystone-Loening Corporation is also working on a big ship—an amphibian that will eclipse the Patrician we have just mentioned. The new craft will be of the amphibian type with cabin for thirty-two passengers.

Amphibian planes have recently leaped into a wide popularity. Three of the most widely used models are the Sikorsky, Loening and Ireland. Igor Sikorsky, whose plant is a part of the vast Curtiss enterprise, has put especial effort into his amphibians with the intention of stressing features of luxury and beauty. Silk curtains, dome lights, rich upholstery and numerous innovations for comfort and ease such as radio, ice-boxes, and cigar lighters are only a few of the touches of genius the Russian pioneer flier has applied to plane building in the United States.

In the speed classification, one of the outstanding commercial ships developed in America during 1929 was the Lockheed Air Express. This differs from the Lockheed Vega, its trim, speedy forerunner, in that the fuselage is suspended from the wing by four short struts. The almost perfect streamlining of the Air Express and a



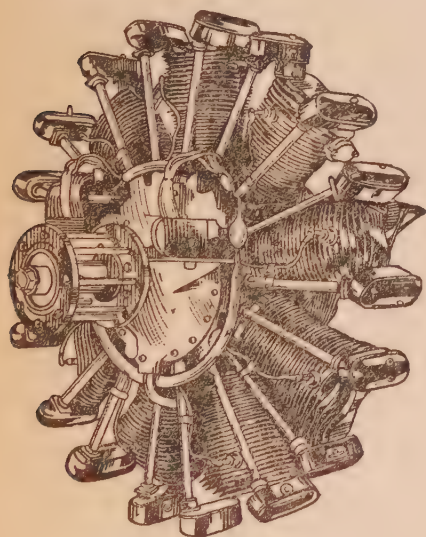
THE "WASP" MOTOR

Wasp engine gives it a cruising speed of one hundred and fifty miles an hour.

These are but a few examples of the vast number of plane types brought out during the year. The United States led the world in the number of models with a total of almost one hundred and fifty different types of ships. The different types of airplanes we built in 1929 greatly outnumbered the different types of automobiles.

It would be a needless task to discuss all of these ship types, for there is the absolute certainty that many of them are doomed to disappear before very long. When Henry Ford visited the Detroit aircraft show and viewed the hundred and four exhibits there he said:

“This all reminds me of the automobile shows of twenty-five years ago. We had a lot of different makes of automobiles in the shows twenty-five years ago. You have a lot of ships in this show. That is the outstanding thing about it, the number of ships. In the end the same thing will happen that happened in the automobile business. There will be many consolidations, and a few large companies will take over the important work of standard production.”



THE WRIGHT WHIRLWIND MOTOR

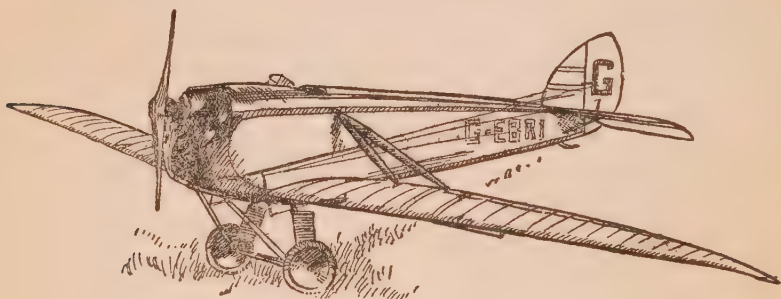
And now, let us leave the ships themselves and look into the other departments of aviation. First, let us see what the radio has done for flying. It has done a great deal toward increasing the safety in aviation, principally through broadcasting weather reports and as a

guide to planes encountering fog-enveloped areas.

Air mail and passenger transport planes are now almost universally equipped with radio receiving sets. Many also have sending

sets. Through these the pilots are in constant touch with the field they leave and the field for which they are headed. They are informed every few minutes of weather conditions ahead and numerous instances have been recorded where storm warnings have come in time for pilots to land their planes before they reached the "thick" weather zones.

An instrument used in experiments for radio signal receiving in fog-bound flights consisted of three tiny electric bulbs; a white light flanked by two red lights. When the plane was true to its course the little white light glows steadily, but if the ship veers to the left or right, the red bulb on that side lights up, so that the pilot has only to use his rudder to correct his course.



THE "HUMMING-BIRD"

An army radio beacon was tested at Mitchel Field, Long Island. This was found to make it possible for a ship to steer straight for the field in the densest fog. The beacon has a range of four hundred miles by day and 1,500 miles at night.

An intense study of fog-flying conditions, with an extensive program of experiments to reduce its hazards, is being made by the Guggenheim Fund for the Promotion of Aeronautics. Much of the practical program of this work was placed in the hands of James Doolittle, crack army stunt flier, who resigned a lieutenant's commission in the army to devote all his time to the fog problem.

One of the most interesting tests of all, perhaps, was the televox automatic flood light experiment at Newark Airport in Newark,



**New Jersey.** The televox is a combination of microphone, sharply tuned audio-frequency amplifier, and switching arrangement which closes a circuit when a note of the particular pitch to which the amplifier is tuned affects the microphone.

This is how the experiment worked. A pilot turned on a shrill siren which was heard above the roar of the motor, the televox device picked up the sound waves and the flood lights suddenly glared.

Along with the application of the radio to aviation as a factor of safety, there have been numerous other steps to reduce flying hazards, both in plane construction and design, and in the instrument field. In the latter, we should not omit mention of the ice warning indicator. This device is used on mail planes operating over the Rocky Mountains.

This instrument warns fliers of dangerous altitudes where ice may form on the wings of their planes. The formation of ice on a ship's wings involves two dangers. First, it is apt to affect materially the lifting power of the plane, and second, ice sometimes changes the contour of the wing so that normal manoeuvring is no longer possible.

Among the new construction principles for greater safety in flying is the slotted wing. This was first introduced in England by the builders of the famous Handley-Page ships and was brought to America on the Avians. The slotted wing is a sort of auxiliary wing, set in the leading edge of the upper wing panels, fitting snugly in place until the ship reaches the stalling point. Then, at the stalling point, gravity acts on the slot and the auxiliary wing slips out and so prevents the plane from going into a spin.

A great deal of credit for this feature is given to Alfred Leigh, a Chilean pioneer aviator, who claims that he had tested and demonstrated the safety factor of the "Leighding edge" during the World War. In addition to enhancing the safety of flying, the slotted wing also reduces the landing speed of a plane ten to fifteen miles an hour and gives it about the same increase in air speed.

The folding wing is another innovation in plane building that was introduced in America from England. This has nothing to do with the air performance of a ship, but is a step toward solving the

problem of reducing the waste of hangar space. In a hangar accommodating six planes, nine of the folding-wing type can be stored, an increase of fifty per cent.

American manufacturers seemed not eager to embody the folding wing principles in their designs when it was first brought out in England. There was talk of "structural weakness." But when the great impetus to plane building here began to fill up the hangars it was seen that the folding wing might help to some extent in solving the new problem.

The shortage of hangar space was inevitable. Plane building had languished to a pitiful extent in America, as we have shown. Then, when Lindbergh ushered in a new era in aviation here, the pell mell rush was to build planes. No one seemed to think about hangars. Everywhere, the cry was: "Give us airplanes." Rivalry sprang up between cities as airplane manufacturing centers and right now there are twenty-two cities in a race to become the aviation center of the United States. They are Boston, Bridgeport, New York, Baltimore, Miami, Scranton, Pittsburgh, Rochester, Buffalo, Cleveland, Chicago, Detroit, Milwaukee, Minneapolis, St. Paul, St. Louis, Kansas City, Wichita, Dallas, Houston, Los Angeles and Seattle.

Almost every one of these cities enjoys some peculiar advantage in the spectacular race for American aviation honors. New York has the capital; Miami is the natural gateway to the great South American plane market and transport lines; Wichita so far leads the country in number of planes built; Los Angeles claims a perfect climate; Chicago now leads in number of air service lines radiating from her airports; and so on.

In this connection it is interesting to glance at the standing of the first four states in number of pilots and planes. The figures submitted by the American Air Transport Association show that California heads the list with 1,076 pilots and 1,129 ships. New York is second with five hundred and twenty-six pilots and seven hundred and five planes. Next is Illinois: three hundred and eight pilots and five hundred and eighty planes. Michigan has two hundred and eighty-six pilots and three hundred and seventy-two ships.

These figures were published in June, 1929, and at that time there was a total of 4,690 licensed pilots, sixty per cent of whom were engaged in one of the several forms of air transport work.

Let us repeat the number of pilots in this great country of one hundred and twenty million people! Four thousand six hundred and ninety licensed pilots!

We have just noted the scarcity of hangar space in American aviation; there is also a dearth of planes, a need for extension of our air mail and transport lines, a demand for more landing fields, more radio beacons, more lighted airways—the list is almost without end. But what American aviation needs most of all now is pilots!

How strange that must sound to those old fliers who came back from the war or from the training fields with the hope of putting the United States in the lead in commercial aviation! They congregated in the various aero clubs and talked over the situation. They could not get ships. Ten thousand men trained to fly, and most of them eager to fly, but nothing to fly in but condemned planes from Canada and “junk” lying about the country.

But they flew what they could get. And many of them—most of them—paid for it with their lives. For eight years following the war this country was dotted from end to end with up-turned dirt marking the spots of crack-ups and with black smears of burnt wrecks. The ranks of the old war fliers thinned rapidly but they persevered as pilots of the air mail DH “flaming coffins,” as air circus rovers and as gypsie fliers. They stuck to their ships, they hung on to their sticks, they kept a trickle of life pulsating in American aviation, they paved the way to safe flying. God rest their brave souls.



# FAMOUS FLIGHTS

(Published through the courtesy of "*The New York Times*.")

WRIGHT BROTHERS. December 17, 1903. First flight in heavier-than-air motor-driven plane at Kitty Hawk, N. C. 850 feet in 12 seconds.

BLERIOT. July 25, 1909. First flight across English Channel.

CURTISS. May 29, 1910. Albany to New York. 143 miles in 2 hours 46 minutes.

L-59, GERMAN DIRIGIBLE. November, 1917. Bulgaria to German East Africa and return. 4,500 miles.

NC-4, READ, May, 1919. Newfoundland to England, via Azores. 3,925 miles.

ALCOCK and BROWN. June 14-15, 1919. First transatlantic non-stop flight. St. John's, N. F., to Clifden, Ireland. 1,960 miles in 16 hours 12 minutes.

R-34, BRITISH DIRIGIBLE. June 2-9, 1919. First lighter-than-air craft non-stop transatlantic flight, Dublin, Ireland, to Mineola. 3,200 miles in 108 hours, 12 minutes. Left Mineola for Pelham, England, June 13, 1919. 3,200 miles in 74 hours 56 minutes.

SMITH. November 12-December 10, 1919. London, England, to Port Darwin, Australia. 11,500 miles.

KELLY and MACREADY. May 2-3, 1923. Non-stop, New York to San Diego. 2,520 miles in 26 hours 50 minutes.

ROUND-THE-WORLD FLIGHT, CAPT. SMITH, NELSON, HARDING, Jr., WADE and OGDEN. April to September, 1924.

ZR-3 (LOS ANGELES). October 12-15, 1924. Friedrichshafen to Lakehurst. 5,060 miles in 81 hours 17 minutes.

RODGERS. August 31 to September 10, 1925. Left San Pablo Bay, Cal., August 31. Picked up by submarine R-4 on September 10, 15 miles off Kauai, Hawaii. 1,700 miles.

FRANCO. January 22 to February 10, 1926. Palos, Spain, to Buenos Aires. 6,232 miles in 62 hours 52 minutes.

BYRD and BENNETT. May 19, 1926. Kings Bay, Spitsbergen, to North Pole and return. 15 hours.

AMUNDSEN, ELLSWORTH and NOBILE (Dirigible Norge). May 11-14, 1926. Kings Bay, Spitsbergen, over the Pole to Teller, Alaska. 2,700 miles in 71 hours.

DE PINEDO. February 13 to June 16, 1927. Italy and return via South America, United States, Newfoundland and Azores. 25,000 miles.

LINDBERGH. May 20-21, 1927. First non-stop flight New York to Paris. 3,610 miles in 33½ hours.

CHAMBERLIN and LEVINE. June 4-5, 1927. Non-stop New York to Eisleben, Germany. 3,905 miles in 42½ hours.

MAITLAND and HEGENBERGER. June 28-29, 1927. Non-stop Oakland to Honolulu. 2,407 miles in 25 hours 50 minutes.

SIR ALAN and LADY COBIHAM. November 17, 1927-May 31, 1928. England to South Africa and return. 22,000 miles.

COSTES and LE BRIX. October 14, 1927-April 14, 1928. Paris, and around the world via Africa, South America, Central America, Mexico, United States, steamship across Pacific to Tokio, then across China, India, etc., to Paris.

GOEBEL and DAVIS. August 16–17, 1927. Non-stop Oakland to Honolulu. 2,407 miles in 26 hours 17 minutes 33 seconds.

BROCK and SCHLEE. August 27 to September 14, 1927. Harbor Grace, N. F., to Tokio, Japan, via Europe and Asia. 12,295 miles; 18 days, 145½ flying hours.

BYRD, NOVILLE, ACOSTA, and BALCHEN. June 29–30, 1927. Non-stop New York to Ver-sur-Mer, France. 3,477 miles in 43 hours 21 minutes.

LINDBERGH GOOD-WILL TOUR. December 13, 1927, to February 13, 1928. Washington, D. C., Mexico City, Central America, South America, West Indies, Havana, and non-stop to St. Louis. 9,060 miles in 116 flying hours.

LADY HEATH. February 12 to May 17, 1928. Cape Town to Croydon, England. 10,000 miles.

LADY MARY BAILEY. March 9, 1928–January 16, 1929. From Croydon, England, to Cape Town and return. 18,000 miles.

KOEHL, HUENEFELD, and FITZMAURICE, April 12–13, 1928. First East-to-West transatlantic flight. Dublin, Scotland, to Greenely Island, Canada. 2,125 miles in 36 hours 30 minutes.

WILKINS and EIELSON. April 21, 1928. Non-stop Point Barrow, Alaska to Spitsbergen. 2,200 miles in 20½ hours.

CARRANZA. May 25, 1928. San Diego to Mexico City. June 11–12, 1928. Mexico City to Washington. 1,575 miles.

SMITH (AUSTRALIA), ULM (AUSTRALIA), LYON (UNITED STATES). May 31 to June 10, 1928. Oakland, Cal., to Sydney, Australia. 7,800 miles in 88½ flying hours.

AMELIA EARHART, STULTZ, and GORDON. June 17–18, 1928. Trepassey to Burry Port, Wales. 2,100 miles in 20 hours 40 minutes.

FERRARIN (ITALY), DELPRETE. July 5, 1928. Non-stop Rome, Italy, to Point Genipabu, Brazil. 4,475 miles.

KUBALA. August 3, 1928. Left Le Bourget Field, Paris, for America; turned back and landed 60 miles off C. Finisterre, Spain. 36 hours in the air.

HASELL and CRAMER. August 16, 1928. Left Rockford, Ill., for Europe; forced down near Mount Evans, Greenland. Rescued September 2, 1928.

GRAF ZEPPELIN—ECKENER. October 11–15, 1928. Friedrichshafen, Germany, to Lakehurst, N. J., via Bermuda. 6,000 miles in 111½ hours. October 29–November 1, 1928. Lakehurst to Friedrichshafen, Germany, 4,400 miles in 68 hours 46 minutes.

PATTERSON. December 7, 1928, to January 10, 1929. Left Miami for a cruise to Cuba, Central America, Northern South America and West Indies, to Jacksonville, Fla.

WILKINS. December, 1928, to January, 1929. Graham Land, Antaretica and vicinity.

BYRD. January 2, 1929. Bay of Whales and vicinity.

HAWKS and GRUBB. February 4–5, 1929. Los Angeles to Roosevelt Field. 18 hours 21 minutes.

GRAF ZEPPELIN—ECKENER. August 29, 1929. Lakehurst, N. J.—'round-the-world with stops at Friedrichshafen, Germany, Tokio, Japan, and Los Angeles, California. 19,500 miles in 21 days, 7 hours and 26 minutes.

GRAF ZEPPELIN—LEHMANN. September 4, 1929. Lakehurst, N. J., to Friedrichshafen, Germany. 5,300 miles in 67 hours. (This flight across the Atlantic lowered the 'round-the-world record, counting it from Friedrichshafen-to-Friedrichshafen to twenty days and four hours.)













